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# OFFICIAL PROCEEDINGS OF THE FIRST ANNUAL CONVENTION

OF THE

# INTERNATIONAL MASTER BOILER MAKERS' ASSOCIATION

HELD AT

THE HOLLENDEN HOTEL

CLEVELAND, OHIO

May 21, 22 and 23, 1907

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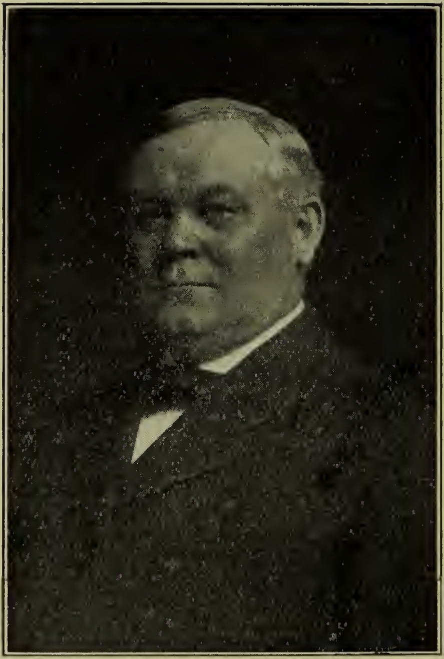

George Wagstaff,
President.

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# OFFICERS FOR 1907-1908

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Buffalo, N. Y.

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Erie R. R., Meadville, Pa.

SECOND VICE-PRESIDENT,
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American Locomotive Company, Paterson, N. J.

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SECRETARY,
HARRY D. VOUGHT,
62 Liberty Street, New York City.

TREASURER,
FRANK GRAY,
806 N. Madison Street, Bloomington, Ill.

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D. G. FOLEY, D. & H. R. R., Green Island, N. Y.
P. J. CONRATH, M. P. R. R., St. Louis, Mo.
A. N. LUCAS, C. M. & St. P. R. R., Milwaukee, Wis.
JAMES J. FLETCHER, 610 Bathhurst St., Toronto, Ont.

# PROCEEDINGS.

## OPENING SESSION.

The Sixth Annual Convention of the International Railway Master Boiler Makers' Association, in joint session with the Master Steam Boiler Makers, was called to order at 10 o'clock on the morning of May 20th, at the Hollenden Hotel, Cleveland, Ohio, by President C. L. Hempel.

The Rev. Buchler Pratt, of the Euclid Avenue Methodist Church, invoked Divine blessing.

PRESIDENT HEMPEL—I assure you it gives me great pleasure to extend to you one and all this morning a most hearty personal greeting. We have with us to-day some of the master minds of the mechanical profession, and we have with us a representative of the chief executive of this great city, whom I now have the honor of introducing, Mr. Harris M. Cooley, a member of the Board of Public Service.

### Address of Mr. Harris M. Cooley.

*Mr. President, Ladies and Gentlemen:*

I regret very much that Mayor Johnston is not able to be present this morning in person to welcome you to our city. He is engaged in court in a very strenuous conflict which we are having at the present time. I trust that he may be able to drop into your convention and look into your faces during the progress of your meeting; but in his behalf and in behalf of the city, we are glad to extend to you to-day a most hearty welcome to our municipality.

There is a common social life which is more than the lives of the individuals which make up a city. There are characteristics which belong to every great municipality, and I trust that hospitality is one of the characteristics of our city.

We are glad to welcome you to the great metropolis of Ohio. I am sure our Cincinnati friends will forgive us for our pride in our own city. We are glad to welcome you for what you are and what you represent. Yesterday I had the pleasure of welcoming the National Association of Musicians; we are not welcoming you for the music you make, but for the work you are doing. We sometimes look out upon the buildings, the factories, the railroads and the steamships, and we are impressed with the magnitude of the developments of our age, and we forget that back of the great factories, steamships and all the pondrous machinery are the men who conceived them, and the men who made them are infinitely greater than the things which they have made.

We are glad to welcome you for what you represent of human progress and development. In one hundred years the power which you are able to employ by your work and by your skill has increased the productive power of man fifty fold. That is, by using that power, that skill and genius we are able to produce fifty times as many of the things of life as our forefathers could produce one hundred years ago. So we feel that you have a part in the great civilization which is showering blessings on the great multitudes; which is producing so rapidly that the things which only princes could enjoy then are now the common lot of all the people. So we rejoice in the work you are accomplishing.

E. S. Fitzsimmons,
First Vice-President.

We are glad that you have come in our midst, that you have brought us your presence and your good-fellowship. Emerson says, "Happy is the house that shelters a friend. It might well be built like a festal board to entertain him for a day." And so, when our friends have visited us we have found that they left with us a feeling of good-fellowship and kindness that has made our home richer, and I feel that when you have gone from our city our life will be better; we will be a better city because you have been for a few days in our midst.

We are glad that you came to Cleveland at this time of the year. Cleveland will have on her bridal robe from now on until the last of June.

Our city is now so beautiful that many of our people do not care to leave it even to go to heaven at this season of the year. It is a little chilly this morning, but I assure you that as the days grow warmer you will be delighted with the city. We are not especially proud of our city, either. It is a poor man who does not love his own wife best, and it is a poor citizen who is not loyal to his own city.

We are glad that you came to us for what you are trying to do, and we trust that your meetings may be of much benefit by the mutual exchange of plans and purposes and that you will work out some far greater enterprise that will bring in greater profits. You are here that you may take part in the world's great progress and enterprise; that you may improve the power which drives the machinery—the power which brings greater blessings to all humanity, all the children of men.

We hope that you will have a delightful fellowship together, and we hope that when you go from among us you will carry with you pleasant and happy memories of our fair city by the lake.

Again, in behalf of our Mayor and of the people of our municipality, we bid you a hearty welcome to our midst.

PRESIDENT HEMPEL—It gives me especial pleasure to introduce to you a gentleman whom I have known for a number of years; a gentleman who has always proven himself a friend to the boiler maker; a gentleman who has favored us with his presence at many of our annual meetings, and who has spoken kind and encouraging words to us, Mr. J. F. Deems, Superintendent of Motive Power of the New York Central, who will now address you.

### ADDRESS OF MR. J. F. DEEMS.

*Mr. President, Ladies and Gentlemen:*

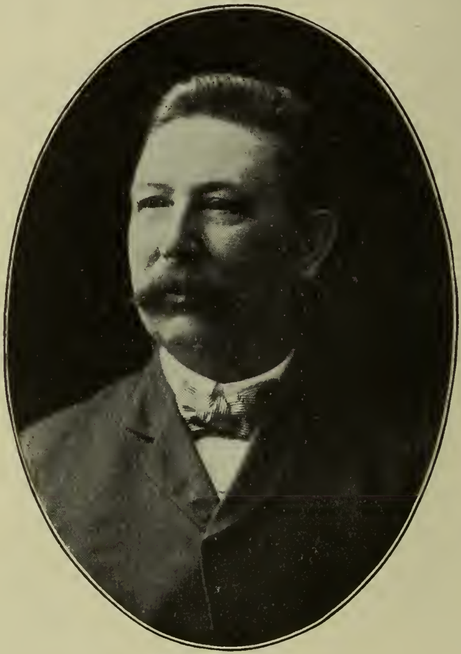
Had I known when our good friend Wagstaff did me the honor to ask me to be present on this occasion how completely my time was to be occupied with duties in my regular line of work, which could not and would not be put off, I should certainly have been compelled by a proper sense of modesty, as well as by a sense of justice, to this body of intelligent men of affairs, to have declined, but as not infrequently happens in this busy life or ours, I thought I might find the time to give the subject proper thought and come here with something to say that might, possibly, interest a few and not bore very many. However, you know what Bobbie Burns says about "The best laid plans of mice and men."

Even though I am here with nothing to say that may interest anyone I am just selfish enough to be glad to be here anyway, as it gives me a chance to meet a number of men engaged in practically the same occupation that has been my life work from my early boyhood, some of whom I have known personally for many years, and others I have known indirectly. It gives me a chance to meet them, shake hands, touch elbows, smoke a cigar and, possibly, take a drink—of water—together, and when I heard there was to be a gathering of a large number of boiler makers, I just could not resist the temptation to come.

It reminds me of the story of the junk dealer who bought an old horse that had been in the fire department for many years; all went well until one day the owner was down town jogging along with his cart heaped high with cast-off pots, pans, old stoves and stove pipes, etc. The fire alarm sounded, and like a flash the old horse struck a two-forty gait. Jerking the lines out of the driver's hands, down the street he went, strewing junk to the right and left with great clatter and noise.

And I guess I am the old horse, and when I heard of this meeting I just couldn't stay away.

We have read with unspeakable horror of the death and desolation caused by some of the plagues that visited the earth away back in the early days, when men were carried off by thousands each day and dead bodies lay festering in the highways and byways because there were not enough people untouched by the scourge to bury them.



E. J. Hennessey,
Second Vice-President.

Or, of the ravages of wars, both ancient and modern, in which the slaughter and carnage was appalling and unspeakable. But, my friends, you may, if you will, imagine even the worst of these, and then multiply the horror many times, and you get but the faintest shadow of a picture of what the result would be, were the civilized world deprived for even a short time of the product of the efforts of the men assembled here to-day—STEAM!

Dwell for a few moments, if you can, on the conditions that would prevail, if by some occult or supernatural process the power to generate steam in any way suddenly annulled or suspended over night with the thermometer registering ten degrees below zero, you get up in the morning to find the house cold and cheerless, no street cars running to carry thousands to and from their homes and places of business; no elevators running in the mammoth office buildings or stores, no steam heat with which to make them warm and comfortable, no electric lights to make cheerful the home, the office, the stores or streets; no water being pumped for its manifold and indispensable uses in all these places, water pipes frozen and bursting. No railroad trains speeding across the country to bear to your very doors the every-day necessaries of life; hundreds of thousands of men, women and children shivering, freezing, starving in their cheerless homes, or walking the dreary death-strewn streets, viewing with sunken, hopeless eyes the smokeless chimneys of countless idle factories.

Think of all these things and many more and you get but a faint conception of the real condition that would prevail were we deprived of that universal agent and servant of civilization, and whose uses and blessings are being multiplied each day and upon which future generations will depend more and more. And in this great work for the future of humanity the organization represented here to-day should lead the van, and with the amalgamation of the two associations, which, as I understand it, is to be effected here to-day, their power for good is certainly much increased and should be wellnigh untold.

But in considering this question of organization, or the consolidation of organization, do not deceive yourselves with the idea that organization can ever take the place of or supplant preparation; remember that preparedness is the secret of most successes in this life, that fate seldom makes league with the unequipped, and that an organization without individual preparation can be nothing but organized incompetence. So don't allow the organization idea to obscure the more important, the more vital, question.

And, my friends, just in this place I want to say that there is another duty incumbent on such bodies as this, which is of paramount importance. Had I the eloquence of a Beecher or Ingersoll, I should wish to make it my life work to go through the length and breadth of this land, yea even to the utmost corners of the civilized world and lift up my voice to a text once propounded by a public speaker: "Is it well with the young man?"

This, my friends, is the question to which this and similar organizations must pay heed or they will be derelict in their duty—"is it well with the young man?"

Are we making proper effort to train him in the qualities that were predominant in the fathers and leaders who have made this great country of ours—a leader in almost every field of endeavor and activity?

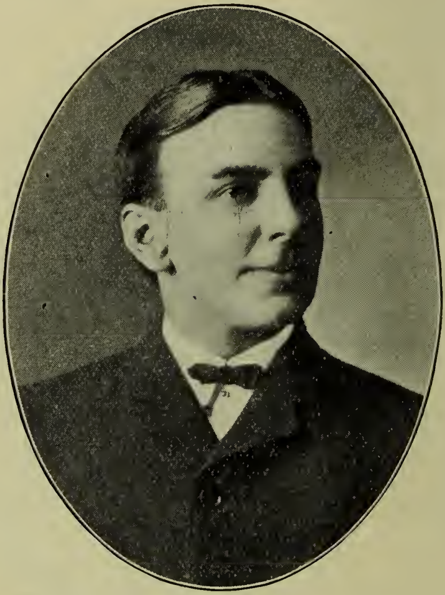
Are we trying to imbue them with a proper spirit of stern integrity, industry and initiative?

Are we impressing upon them that what they are, or what they may become, lies in their own effort and not in the help of others, whether organized or unorganized?

If we are failing in this then all must fail. I want to ask, not only the members of this organization, but of the wives and mothers present, to give this serious, prayerful thought.

Mr. Hemple and also the Rev. Mr. Pratt have referred to the treatment of men, and while this is a subject fraught with great possibilities, it seems to me to be rather a simple problem and is so well set forth in the golden rule that volumes written on the subject would add little or nothing.

In conclusion, I will only say: Go back to you offices, your shops and your homes and try it, and be kind, be kind.



W. M. Wilson,
Third Vice-President.

Response to Mr. Deems.

PRESIDENT SMYTHE—It has been a very great pleasure to listen to the interesting remarks of our worthy friend, Mr. Deems. We all know how well qualified he is to handle his subject. A man of his experience can always be interesting if he only speaks what he knows on his subject. It is not only a pleasure but a high privilege, to be able to listen to the interesting and valuable thoughts of the able speaker who has just favored us, and as a result I am sure we shall carry away with us much that will be useful to us in our future work. Seldom is it that we are privileged to hear from one man so much that is useful and so pleasantly spoken. I hold that not only this convention but the public at large owes a debt to the speaker to whom we have just listened. (I would be glad to entertain a motion that a vote of thanks be extended to him.)

Some time ago the affairs of the New York Railway Club were in a very bad condition, and things went from bad to worse until it seemed that failure threatened the Club's usefulness and existence. Indifference had stamped its bane upon the work of the Club. As a result, interest was lax. The Club was fast losing its influence as a factor for good in the lives of its members. But, fortunately, a certain man was made Secretary who seemed to know just what was the matter. He took hold with a will. There was a change at once for the better. The good work continued, and the Club is now in a very prosperous and useful condition, due largely to the energies and wisdom of the gentleman I have mentioned and whom I now have the pleasure of presenting to you.

Gentlemen, I have the honor and privilege of introducing to you Mr. Vought, Secretary of the New York Railway Club.

## Address of Mr. Harry D. Vought.

*Mr. President, Ladies and Gentlemen:*

You will pardon me if I digress from what is expected of me long enough to make this impromptu expression. Standing in the presence of the First Vice-President of the New York Railroad Club—a gentleman whom we hope some day to see at the head of that organization and who was identified with it long before I was—I feel an explanation is due. Our good friend Mr. Smythe, in his kindness of heart and friendly spirit, has perhaps unwittingly placed the speaker in somewhat of a false position, because, as a matter of fact, when I first became connected with the New York Railroad Club it was already a prosperous organization and had quite a large surplus in its treasury. Its home is not only superior to anything it had previously had, but it is to-day the grandest occupied by any railroad club in the world. And so I dislike to accept credit that does not belong to me, because the Board of Management of the New York Railroad Club is composed of such men as Mr. H. H. Vreeland, of the New York City Railway, who has been its honored President for a number of years; Mr. Deems and others whom I might name, who have sacrificed their time, business and opportunities for social enjoyment that this Club may be progressive and successful in every way.

An invitation from your honorable committee to address this assemblage to-day was a high compliment. To one whose calling, though not actually obscure, is modest and hedged about by distinct limitations, it was indeed flattering. It was also exceptionally gratifying in the sense that, while it gave him personal consideration, this measure of recognition was, undoubtedly, due chiefly to his being a representative of successful combinations of men of earnest endeavor and mutual helpfulness. It imposed, however, a responsibility not easily met. There was evident expectation that he could and would voice wisdom and valuable counsel concerning ways and processes essential to the achievement of a common purpose.

The great favor of your committee was appreciated, but whether its wishes could be fulfilled, and whether you might not be subjected to keen disappointment were serious questions. Therefore, acceptance of the invitation was not without doubt and hesitation, more especially as your committee had the courage, as well as the temerity to name in advance the subject they wished elucidated. That we may properly comprehend one another and from the beginning meet upon a mutually congenial plane, let it be distinctly understood that there remained no alternative except to speak upon that which was not of my own choosing. If what is said should have the ring of familiarity akin to household words and therefore stereotyped, kindly accord the speaker the degree of indulgence once solicited for the orchestra in a mining town:

"Don't shoot the musicians! They are doing the best they know how!"

P. F. Flavin.
Fifth Vice-President.

Discussion of organization takes us into a domain so broad, so comprehensive, and of such vast extent that it is perilous to venture much beyond its border line. The way is enticing and presents so many alluring opportunities that the temptation to wander on, and on, and on, is almost irresistible.

There is a limit, however, to endurance as well as time. Appreciative of this, the speaker will try not to weary you by trespassing upon your patience or beyond the period within which he is expected to finish his address. According to the programme he is limited to thirty minutes. Perhaps before the expiration of that time you will wish that he had been mindful of the admonition of a friend of a man unexpectedly called upon to speak at a dinner, and who, in reply to the question, "What shall I talk *about?*" said, "Oh, talk *about a minute,* and quit!" In that event, to tell you about organization would be to say briefly: It means—get together—stick together—work together—stay together—and to that end work for one another, live for one another, maintain brotherly love, be tolerant, and, like the Scottish bard, lift up your voice in a prayer that some power endow you with the gift to see yourself as others see you.

We learn from the ponderous volume to which we resort for enlightenment as to a definition or synonym, and which a young woman was once heard to designate as her "Uncle Dick," that among other things organization is the "act of forming or arranging the parts of a complexed body in a suitable manner for use and service; the distributing into suitable divisions, or disposition of parts which are to act together as a compact body; to construct so that one part may co-operate with another and take systematized form; that which must have a sound foundation upon which to rear the superstructure."

Here we appear to have not only the essence but the concrete substance of the entire matter engaging our attention; but analysis shows that we have simply the essentials for a proper beginning; the fundamental principles incident to a formative period, the means wherewith to start right. Much more remains with respect to progressing along correct lines that perpetuity may be assured, that there may be cohesion and harmony of operation, in order that there may be neither disintegration nor deterioration, that specific purpose may be achieved, that worthy object may be attained, and that at all times success may crown every proper undertaking. That all this may prevail there must be prudent management, wise use of available forces and correct application of the highest principles. These considerations must be rigidly observed or there can be no long life—the goal originally in view can never be reached.

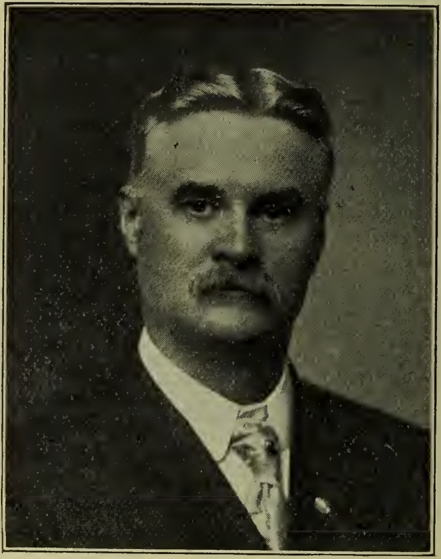
In the further consideration of these points, if some of my statements appear more blunt than delicate, please bear with me, for they are born of long association and of that varied experience which teach valuable lessons with no uncertain emphasis.

Organization is as old as the hills. Creation of the world in which we live furnished the greatest example to man of the genesis of things, the bringing of order out of chaos and of correct procedure and operation. In organization we have a combination of forces that makes for great good or great evil. In their use and application we are mutually helpful or injurious, elevating or destructive, illuminative or disheartening, harmoniously progressive or chaotic and dreaded, if not despised, as a cause of retrogression.

We are living to-day in a period in which organization seems something different from what it was in the days of our forefathers, though history teaches us that they had their share of strife and bitterness with the inevitably disastrous results that these produce. Yet they were possibly slower to action than we of this generation. That past and this present may be likened to the time recorders of then and now as illustrative of conditions under which they moved and those we know to-day. For instance, the swing of the pendulum of the old beloved and familiar grandfather's clock called to them about this way: "Com-m-m-me s-o-o-n!

Com-m-m-me s-o-o-o-n!" To-day the average modern clock bids us, like the hurrying, rushing throng of a metropolitan thoroughfare to "Get there! Get there! Get there!" And woe to him who hesitates or loiters, for the other fellow behind him will surely "get there" *first.*

To talk to members of these associations and tell them about organization and how to make it successful seems audacious. It is much like carrying coals to Newcastle in the light of their experience, in consideration of the fact that not a few have labored in the cause almost from the early morn to the dewy eve of life, and are, we are told, to be witnesses before this convention ends to the value of that unity of effort and singleness of purpose which accords strength and power. What can be said will hardly be new matter, but perhaps its repetition with fresh emphasis may prove of good effect.



E. W. Rogers.
Fourth Vice-President.

Candor compels the admission that we profit not alone by the lessons of personal experience but also that of others, provided these lessons are rightly applied. This is as true of association as of individuals. Furthermore, in addition, there must be maintenance of activities which promote healthy growth and give stimulus, with a never ending desire for more advantages and benefits to be accorded all concerned. Always set your standards high and be never contented unless they are reached. This will give strength and influence, a constant widening and extension of the sphere of usefulness occupied.

One of the brightest and best examples of successful organization in its policy, management and work is the New York Railroad Club. It is mentioned here because it is recognized and entitled to the proud distinction of being practically the progenitor of many other organizations of railroad men. Time will not admit of details concerning its method and the secret of its splendid success, but with the history of the Club they are commended with pride to your contemplation and study, as well as worthy of the closest emulation by any other organization ambitious for equally high rank and unbounded usefulness.

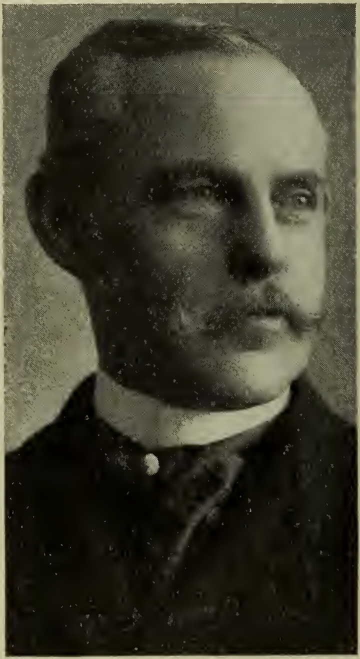
Recognized to-day as an essential element and made a feature of the work of many active organizations, are social divertisements. Combined with the less absorbing demands of serious business that invariably interest only a certain proportion of members, these are always salutary. They can never, with safety, however, be allowed to lead to a sacrifice of dignity or the higher intellectual objects and practical enlightenment of mankind which should be the chief aim of organization, in the intelligent exchange of opinions and in the recital of experiences demanding the best skill and knowledge.

Associations having a widely scattered membership and meeting only once a year, do not afford equal opportunity for personal interchange of thought and opinion. There cannot be the same degree of activity and multiple benefits accruing to those connected with such as have frequent sessions. But what is done and the results attained can have a decidedly corresponding value. At the same time there remains and is strongly emphasized, under the circumstances, the interdependence of the members because it is much greater. To maintain interest and to keep the organization healthy, prosperous and successful is not so easy, and so much more has to be done by officers and members. A measure of responsibility is involved for every individual that cannot be safely slighted. It demands persistent energy, unflagging diligence, constant vigilance, immediate grasp of opportunity and the liveliest appreciation of duty. If advantages certain to present themselves in your daily avocations are grasped without hesitation, every member going to the annual convention will not only be prepared to intelligently participate in its deliberations, but will profit by what he hears and learns. He will be helpful and will be an important factor in exemplifying what the brotherhood of man means and is. So will each do his part in preserving and magnifying the unit, and prove beyond cavil or successful contradiction that to be associated together, in spite of the limitations stated, is of real and lasting practical worth.

To give practical value to membership an organization must be prepared and able to show at all times that something substantial is gained from identification with its work; to prove that hours and labor given to it is not time wasted, that the interest with which men invited to unite with it are connected, profit by what is done. This latter consideration is sure to command individual and corporate approval and gives assurance of the best and most lasting results.

Be careful and conscientious in your choice of officers. Failure to do so has wrecked more than one organization. See that they are men whose personal ambition does not exceed their zeal for the organization, who have the ability, the administrative capacity and the skill to initiate, to direct, and to rule with that firmness which, while maintaining harmony among the brethren, commands respect and ready recognition of authority.

Gratification of individual ambition to the exclusion of what is really best for an organization is the canker that assaults and insidiously destroys its life. Personal selfishness should never be allowed to work the sacrifices that are destructive and engender unseemly strife. Once inducted into office the officers should and must have your loyal and undivided support, for it is an inspiration to unremitting effort. Those responsible for putting them in office must do their part or an important element in the attainment of uninterrupted success will be wanting. This is a duty that must be performed without hesitancy or equivocation. The obligation is imperative, and from it there is no escape if faithful to yourself, your associates and, above all, to your organization.



Harry D. Vought,
Secretary.

But this is not all. Great importance attaches to individual responsibility and diligent personal effort. It is the mainspring, the very life, almost, of an organization. It is upbuilding and uplifting. It keeps things moving. Nothing less will suffice in the increasing of membership. Enlargement of an organization is almost entirely dependent upon the intensity with which it is exercised. Vigilance is promoted. Nothing is lost sight of that will be conducive to general advancement, to the greatest good of the greatest number.

While committee reports and conclusions based upon careful and thorough investigation are ever of immeasurable value, the introduction of individual papers is always to be encouraged. The exceptional value and profit of this idea has been sufficiently demonstrated to prove that the tendency is to elevate the standard of work and enhance the character and reputation of an organization before the world. This is a fact that has received recognition from every organization introducing individual papers as a feature of its curriculum. It has contributed to pronounced progress. It is a practice worthy of general adoption in connection with technical features that come up in daily experience. Each time a special topic is thus presented by an individual who has made his subject a matter of special study and experiment, and whose deductions are beyond captious or superficial criticism, attention is concentrated upon an organization in a manner highly beneficial and the demand for its literature increases. Men of recognized authority, either as experts or teachers, engaged in the solution of big problems, can usually be induced, when properly approached, to give you the benefit of their thought and experience.

Is a strong, progressive, prosperous, harmonious and respected organization desired? Then be always zealous, united in action and effort, considerate of individual rights, and tolerant of opposing opinion and conviction. It has been truly said: "In unity there is strength, in strength there is power, and in power is concentrated the force with which to attain a given purpose."

Be mindful that there is a sense of satisfaction in being constantly united and a solid phalanx for good. It is unity and disposition that win and properly shape the ends of an organization. This condition maintained, there will never be damage to repair, dry rot will never creep in and undermine the life of an organization. As the good that men do lives after them, so your deeds and acts have the greater reward and the results of your work so shine as to be a lamp to the pathway of your associates and to those who come after you when the burden of life has been shifted to other shoulders and you dwell above, "in that mansion not made with hands, eternal in the heavens." (Applause.)

## Response to Mr. Vought.

PRESIDENT HEMPEL—I have been associated with railway societies for a number of years, and I heartily agree with Mr. Vought's remarks as to the secretary of an organization. It is very important that we secure the very best secretary that we can obtain for our organization, inasmuch as we are not in a position to take care of the work and take care of our business at the same time. I might say that I had a letter from our present secretary saying that he was crowded with work and that it was almost impossible to take care of the matter as he should, and the same thing is true of every member of the association. It seems to me that we should try to secure the services of some one for secretary who can give at least a large part of his time to our work. Much depends upon a secretary. In fact, I believe that the success of an organization depends upon that officer.

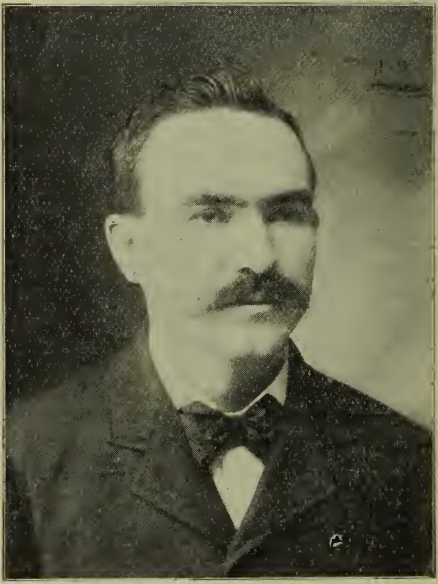
If I were to go into a discussion to any extent, I would but repeat what Mr. Vought has said, that we should be very careful in the selection of our next secretary.

## ADDRESS OF PRESIDENT J. H. SMYTHE.

*Ladies and gentlemen and members of the International Railway Master Boiler Makers' Association and the Master Steam Boiler Makers' Association:*

It gives me great pleasure to meet you on this, the Sixth Annual Convention, on this great occasion when two organizations meet as one grand Association. There has been much enthusiasm in regard to the consolidation of these two associations, and, to my way of thinking, it should be so, for the result of this action will be of lasting benefit to all concerned.

It is fortunate, indeed, that on such a happy occasion we have the pleasure of meeting in this beautiful city of Cleveland, a city noted for its fine buildings, grand streets and beautiful parks, a place of such great commercial importance, the leader of the lake ports in the production of steel vessels, the home of boiler makers and the resting place of the remains of our dearly beloved President Garfield, one who was fearless in his convictions and who believed in doing the right as he saw it.



FRANK GRAY,
Treasurer.

I feel deeply gratified at the hospitality extended to us by the generous people of this city. We have been made to feel that we are welcome here, and I know I do but voice the thought of each guest present when I say that we are glad indeed to be with you in this city, and glad to accept the hospitality so kindly extended to us.

I deeply feel the pleasure and honor of meeting you as the President of the Master Steam Boiler Makers' Association, a body of men so widely representative, a body that represents all classes of sheet iron workers. We are a company of men who believe that we do not know it all, therefore we meet to learn from one another. We believe in expansion. We know there are many problems to solve and that it is our work to solve them. We realize that the best way to accomplish these ends is for us to meet and exchange ideas, and that is our object at this time.

These two associations remind the speaker of two lovers who have courted for awhile, quarreled and said mean things to each other, and later have found out that they cannot be happy apart from each other, and have then made up and become engaged. We have had a like experience and have been engaged since last May (and the promise made more binding in September) and now we have met for the great event of becoming united. (Taking hold of the hand of President Hempel.) We, the Master Steam Boiler Makers' Association, promise to help, support and protect this grand association, and may the God of Peace add his blessing to it. (Applause.)

We believe there never was a time before when the public was as much interested in the boiler makers' business as at present. And is it to be wondered at when we realize that the boiler is such a necessary thing in our present way of living? We find the boiler in the home, the small shop, the mill, the mine, the factory, the public building, the church, the school, in every line of public travel, and, in fact, wherever our present mode of life finds a use for steam, there we find the boiler. And now one inventor sets forth his belief that the airship will never be a success until steam makes it possible. Millions of lives are spent in close proximity to countless boilers. The making of these boilers is, therefore, a very important business. Where will you find a business that requires more skill than ours? The tailor cuts and fits, the carpenter shapes and joins, the smith forges and allows enough to machine off, the machinist files and fits, but the boiler maker takes the sheet of steel, lays it out, bends it and puts it together in the form of a perfect article. The least mistake would cause a great loss, not only of money but probably of lives. Not one or a few only might be put to inconvenience and suffering, but hosts. Therefore it is necessary that we should know our business thoroughly. We *must* keep up with the times. And that is why we meet. We have been misunderstood by many thinking that we are simply a labor organization, whose business is the physical advancement of its members. That is not our purpose. We meet not only to learn the best methods of building boilers but also to learn the best methods of handling the men who have this important work to do. Allow me to hope that we shall be successful in accomplishing these important objects.

I wish to congratulate the association on the splendid work that has been accomplished this past year, which our secretary, Mr. Clark, will show in his report. I wish to thank the officers and members of the Master Steam Boiler Makers' Association for the support they have given me during my incumbency as President. It has been a delight to work in joint committee with Mr. Hempel and Mr. Wagstaff.

I beg the privilege of making a few suggestions.

First.—That we choose a new name for our association and that it be short.

Second.—That the officers consist of President, First Vice-President, Second Vice-President, Secretary, Treasurer, and three members of the Executive Board.

Third.—That the Secretary be chosen from outside of the association, if necessary, that we may get a man who makes a business of such work.

Fourth.—It has been noticed in the News Bureau in Washington on March 9th that Secretary Strauss, of the Department of Commerce and Labor, is disappointed with the present method of steamboat inspection, and that marked reform is to be inaugurated. I would suggest, therefore, that this association appoint a committee at this time to use its influence with the proper authorities, and, also, that each member see his Representative at Washington, to see that the inspectors of boilers are chosen from the trade instead of choosing those without practical experience.

As far as I know, it has pleased our Heavenly Father not to call one of our members all last year, and God grant that it may be so for many years to come. And when the time does come for our departure, may all be able to say, "We have built boilers well," and be worthy to receive the reward of our Father for work well done.

I thank you one and all for your kind attention. (Applause.)

## Address of President Hempel.

*Ladies and Gentlemen:*

We have gathered here in joint convention as one great body of our profession. We have gathered here to-day to shape the destiny of our profession. We have gathered here most assuredly for a great purpose, that of carrying out the fundamental principle of our association, which is education.

I rejoice in that we have such splendid prospects to bring reward to those who have labored so faithfully to bring about the consolidation of these associations.

In this advanced age of high pressure and rapid steam generation, we are called upon to meet new conditions. As the railways and steamship lines become greater in the world of commerce, the mechanical branch of the service becomes more intricate anl scientific.

Hence, the necessity of our coming together to exchange ideas and to impart the knowledge which we possess to each other that we may become more proficient in our profession and be able to meet the demands made upon us.

In this terrific war for commercial supremacy the eyes of the world are trained upon our profession. Victory can only be achieved through the mechanical and industrial branches. The only law of this twentieth century industrialism is, "The survival of the fittest." Boiler making today is one of the most important of the mechanical branches, and those who fail to avail themselves of the opportunity this association affords will soon be back numbers and must give way to the "fittest."

We are placed in charge of departments expending from $100,000 to $500,000 per annum in labor and material, and we are expected to deliver the maximum output for a minimum outlay. We can only hope to attain the desired results by properly qualifying ourselves.

The modern, up-to-date boiler foreman fills a position that bears with it an honor, one that is full of responsibilities. The destiny of many lives ofttimes depends upon our intelligence, mechanical ability and knowledge of our profession. Without giving the matter some serious thought, one can hardly realize the responsibility that falls to the lot of a boiler foreman. Few people know of the danger they are encountering when traveling upon the public highways or entering the great ships and railway terminals. Yet they look with amazement when they see the great giant of the rails and the king of the seas with their wheels in motion. They only see the exterior and never stop to think of the interior, where this great power is generated, until the press tells them of the destruction wrought and lives lost by a boiler explosion.

Our association hopes, through the medium of these annual meetings, to increase the efficiency of the boiler and to render the service of our membership of greater value to our employers. We must, therefore, keep apace with the times and bring into practice better facilities and workmanship in order to take care of the boiler and guard the safety of the people.

Above all, the boiler foreman should be a man who knows, sympathizes with and appreciates the world of business and the world of work.

The valuable man in any business is the man who can and will cooperate with other men. Men succeed only as they utilize the service and ideas of other men.

Therefore, may your interest in the general moral advancement of mankind grow deeper and truer so that your value as citizens may be increased. May the gratitude of your own happier fortunes make you more considerate of those whose progress has been impeded by less favorable circumstances, and from the elevation of your success may you remember to reach the hand of assistance to the climber below.

A man, be he king or laborer, loves merited praise. You will pardon me if I say a few words in praise of a profession and of a people I love.

In looking over this magnificent gathering of mechanical men this thought has forced itself upon me: Who are these men and what positions do they occupy in this busy world? Yea, my friends, were I to answer this question I could say, "First place."

First place, because without men of your calling progress and civilization would be at a standstill.

First place, because you have been one of the greatest factors of the mechanical and industrial development of the world.

First place, because you have made it possible to send the giant of the rails at lightning speed all over this broad land.

First place, because you have made it possible to navigate the high seas, making international commerce possible with all the nations of the earth.

First place, because you have been among the first to bare your breasts to the enemy's bullets in defense of our flag, the greatest flag of all nations.

To substantiate this last statement, I might say that when the President called for volunteers to avenge the lives of the boys who went down in the *Maine,* I had 118 men in my employ. Thirty-five of those responded to the call, twenty-three men were accepted and went into the service in the Philippines; five of them were wounded and two of them fell with Stotzenberg and are now sleeping under the flag for which they gave their lives. Why should I not eulogize this type of an American citizen? Why should I not say a few words in praise of these men who are standing sentinel every day of their lives guarding the life and property of our people?

I want to say a few words to the ladies. It is gratifying to see so many ladies in attendance. No function is complete without your presence.

I want to say to you that we have not been unmindful of the silent part that you have played in this great industrial development. Remembering that old adage, "A man's work is from sun to sun, but a woman's work is never done." Yea, it is the woman who inspires the weary mind, sustains the sinking heart, and incites the noble deed. God bless you for the sacrifices that you have made for the sake of peace, happiness and liberty.

PRESIDENT SMYTHE—It is very important that all members present register.

MR. SLATE—The Entertainment Committee wishes to announce that the ladies will meet in the parlor at 2 o'clock and that carriages will be provided for them to take a carriage ride, while the gentlemen are visiting the Collingwood shops.

Thereupon an adjournment was had until 10 o'clock Wednesday morning.

## WEDNESDAY MORNING SESSION.

President Hempel called the meeting to order and announced that the Executive Committees of the two organizations, viz., Messrs. George Wagstaff, John McKeown, William W. Wilson, Charles P. Patrick, P. J. Conrath, E. S. Fitzsimmons, T. W. Lowe, W. H. Shaw, A. E. Brown and G. W. Bennett, would retire in order to work on the constitution and by-laws, after which he surrendered the gavel to President Smythe.

PRESIDENT SMYTHE—I assure you that I appreciate the honor of presiding over a body of intelligent men like this, but you must not forget that your chairman cannot make this meeting a success unless he has the hearty co-operation of every one of you.

We realize that we are not orators; we are just common boiler makers. Our people call us Master Boiler Makers. We are masters of our trade, but, nevertheless, we are housed up in the factory from one year's end to another, and we do not have opportunities to make many speeches. We will ask the indulgence of our reporter, Miss Unkenholz, and if we make grammatical errors she will correct them. So often when we are in our seats we think up our little speech, and when we get up to deliver it we forget all about it. We will just get up quickly and be ourselves and our thoughts will come to us.

You who have no programs are to blame, for you had one sent to you and you have left them at home.

## ARCH TUBES AND BRICK ARCHES.

The following papers were read by Secretary Goodwin:

WEST MILWAUKEE, WIS., *March* 29, 1907.

*Mr. G. W. Bennett, F. B. M., N. Y. C. R. R., Albany, N. Y.*

DEAR SIR:—In reply to your letter of January 17th, which has been held up by me while seeking the necessary information from outside parties in regard to the benefits derived in using arch tubes and arch brick, will state that there has been very few tests made until recently by any of the railroads.

We have now about one thousand engines equipped with arch tubes and arch brick and have not made a test of any kind since 1893, at which time we made a test with two engines, one simple and one compound, both narrow fire-boxes, with and without arch bricks. It was plainly demonstrated, at that time, that by using arch tubes and arch brick there was a saving of fuel, better than 10 per cent. Since 1893 we have bought all our heavy power, both wide and narrow fire-boxes, all using arch tubes and arch bricks. No tests have been made.

We are expending, annually, for arch tubes and arch bricks $50,000, which is the first cost. For applying and renewing it costs us about another $50,000 Figuring that our fuel bill is $5,000,000, and that we are saving 10 per cent. by using arch tubes and arch bricks, we have to our credit $400,000 after deducting the cost of applying and renewing arch tubes and arch bricks.

We have also a number of engines equipped with the hollow arch brick, which we are testing out at present. These are showing up better results than we are getting from the solid arch.

Will also state that we are getting from our heaviest power, freight and passenger, from twenty-four to thirty-six months' service between full flue renewals, making from 100,000 to 230,000 miles. In 1904 we applied twelve fire-boxes on the system; in 1905, eight fire-boxes; in 1906, eight fire-boxes. This to show that we are getting fair service from our flues and fire-boxes.

I have recently had a statement from the Santa Fé, also from the Pere Marquette R. R., who have been making a practical test with no arch, solid arch and hollow arch. They show a saving better than 5 per cent. with solid arch over no arch, a saving of better than 20 per cent. with hollow arch over no arch.. The abatement of black smoke expressed in term of per cent. of the elimination. Hollow arch over no arch, in freight service, 65 per cent.; in passenger service, 76 per cent. Blue prints herewith, giving complete record of tests. Please return print.

The only point against using arch tubes is the liability to open in the seam, on account of defect, or rupture on account of accumulation of mud.

If this is looked after closely, there will be but very few cases of this kind.

In using arch brick, we are unable to clean out flues or to calk flues when leaking slightly, and a great many times we let them go. This to save taking out arch brick. Engine is undoubtedly held out of service a good many times longer on account of having arch brick, when there is fire-box or flue work to do, as engine must be cooled down and arch taken out before boiler work can be done. Where if there was no arch, steam could be blown off and boiler work done and engine again put in service very quickly. These are perhaps all the points against using arch brick.

Trusting this will be all that you are looking for, at the same time, if you can think of anything else that I should have said kindly let me know.

With best wishes, I am,
Yours truly,

A. N. LUCAS.

# TESTS MADE WITH I. O. S. CAR SCRANTON

## By W. N. Mitchell, Gen. Mgr. Railway Dept.

Engine No. 558.
Topeka to Newton

A. T. & S. F. Railway
Train No. 5.

| Device Tested. | Date Aug. | Cars in Train. | Tons in Train. | Av. Spd. M. P. H. for Trip. | Av. Spd. M. P. H. Actual Rg. Time. | No. Mins. Engine was Using Steam. | Av. Lbs. Boiler Pressure. | Total Lbs. of Coal Fired. | Total Lbs. of Water Evaporated. | Lbs. of Water Evaporated Per Lb. of Coal. | Coal Per 100 Ton-Mile. | Coal Per Train-Mile. | Coal Per Minute Engine Used Steam. | % of Total Time Smoke was Made. | Injector On % of Total Time. | Injector No. Times Shut Off. | Pops Open % of Total Time. | Pops Open No. of Times. | Blower On % of Total Time. | Blower On No. of Times. | No. of Times Grates Shaken. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Solid Arch.... | 7 | 10 | 567 | 29.25 | 36.51 | 198.0 | 214 | 11,240 | 73,200 | 6.512 | 14.4 | 83.45 | 56.77 | 69.9 | 82.8 | 16 | 0.80 | 2 | 16.0 | 17 | 7 |
| Solid Arch.... | 9 | 11 | 578 | 35.90 | 37.50 | 201.5 | 212 | 11,000 | 71,200 | 6.473 | 14.1 | 81.72 | 54.59 | 68.7 | 85.8 | 19 | 2.00 | 7 | NO Record | | 6 |
| No Arch ..... | 11 | 13 | 672 | 35.97 | 37.82 | 186.8 | 208 | 13,800 | 77,606 | 5.624 | 15.2 | 102.50 | 73.86 | 68.5 | 80.6 | 28 | 2.19 | 5 | 12.5 | 11 | 8 |
| Hollow Arch... | 13 | 11 | 570 | 34.45 | 37.56 | 196.2 | 211 | 10,400 | 76,400 | 7.346 | 13.6 | 77.26 | 53.01 | 48.2 | 72.5 | 25 | 3.74 | 7 | 10.9 | 17 | 7 |
| Hollow Arch... | 15 | 9 | 503 | 37.33 | 41.00 | 171.5 | 214 | 9,600 | 70,600 | 7.354 | 14.2 | 71.32 | 56.00 | 50.8 | 81.4 | 15 | 6.20 | 17 | 1.4 | 6 | 9 |

Engine No. 558.
Newton to Topeka

A. T. & S. F. Railway
Train No. 6.

| Device Tested. | Date Aug. | Cars in Train. | Tons in Train. | Av. Spd. M. P. H. for Trip. | Av. Spd. M. P. H. Actual Rg. Time. | No. Mins. Engine was Using Steam. | Av. Lbs. Boiler Pressure. | Total Lbs. of Coal Fired. | Total Lbs. of Water Evaporated. | Lbs. of Water Evaporated Per Lb. of Coal. | Coal Per 100 Ton-Mile. | Coal Per Train-Mile. | Coal Per Minute Engine Used Steam. | % of Total Time Smoke was Made. | Injector On % of Total Time. | Injector No. Times Shut Off. | Pops Open % of Total Time. | Pops Open No. of Times. | Blower On % of Total Time. | Blower On No. of Times. | No. of Times Grates Shaken. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Solid Arch.... | 8 | 12 | 629 | 34.58 | 38.92 | 189.0 | 210 | 9,750 | 58,400 | 5.990 | 11.51 | 72.44 | 51.50 | 46.3 | 85.7 | 16 | 2.4 | 5 | 2.7 | 1 | 16 |
| Solid Arch.... | 10 | 10 | 544 | 35.42 | 40.04 | 187.0 | 209 | 9,400 | 60,400 | 6.425 | 13.19 | 69.84 | 50.26 | 56.7 | 61.0 | 28 | 8.4 | 8 | 2.1 | 5 | 2 |
| No Arch...... | 12 | 14 | 705 | 37.14 | 38.80 | 192.9 | 204 | 10,400 | 66,800 | 6.423 | 10.90 | 77.26 | 53.88 | 79.1 | 73.4 | 22 | 1.1 | 5 | 6.1 | 9 | 5 |
| Hollow Arch... | 14 | 14 | 726 | 32.04 | 36.98 | 196.7 | 211 | 10,000 | 71,200 | 7.120 | 10.23 | 74.29 | 50.76 | 33.1 | 76.6 | 20 | 7.9 | 19 | 11.6 | 20 | 9 |
| Hollow Arch... | 16 | 10 | 498 | 39.18 | 42.78 | 173.7 | 199 | 9,075 | 64,400 | 7.096 | 13.34 | 67.42 | 53.03 | 50.0 | 73.8 | 21 | 0.5 | 6 | 1.3 | 20 | 6 |

Note.—Train No. 6, Aug. 16th.—Back end of grate rest broken—Bars sagged in consequence, could not shake back section

Evaporation,—— lbs. of water per lb. of coal.

General Average.—No Arch—6.023 per cent. gained hollow arch over no arch—20.3

General Average.—Solid Arch—6.350 per cent. gained hollow arch over solid arch—13.86

General Average.—Hollow Arch—7.230

W. N. MITCHELL, *Gen. Mgr. Railway Dept.*

Tests conducted by International Correspondence Schools.
W. N. Mitchell, Gen. Mgr.
Railway Department.

# LOCOMOTIVE EVAP

## To Determine the Merit in Certain

| Series Designation. | Kind of Service. | Test Number. | Date. | Conditions; as regards Special Equipment. | Terminals of Test Runs. | Mileage. | Cars in Train. | Tons in Train. | Hundred Ton-Miles. |
|---|---|---|---|---|---|---|---|---|---|
| A | a | b | c | d | e | f | g | h | i |
| **Engine** 288 Equipped *vs.* not Equipped. | Freight | 1 | Aug. 28 | No Special Equipment. | Oakdale to Plymouth. | 124.7 | 24 Lds.<br>10 Mts. | 1150 | 1434 |
| | | 2 | Aug. 31 | W. N. Hollow Arch<br>Var. Exh. Nozzle<br>Feed Water Heater† | Oakdale to Plymouth | 124.7 | 30 Lds.<br>2 Mts. | 1150 | 1434 |
| | | 3 | Aug. 29 | No Special Equipment | Plymouth to Grand Rapids | 127.6 | 11½ mi=20L.5E<br>94 mi=29L.5E<br>22 mi=29L.3E | 1045<br>1473<br>1391 | 1810 |
| | | 4 | Sept. 1 | W. N. Hollow Arch<br>Var. Exh. Nozzle<br>Feed Water Heater | Plymouth to Grand Ledge | 74.8 | 11½ mi=20L.9E<br>63 mi=29L.8E | 1044<br>1435 | 1028 |
| B | | | | | | | | | |
| **Engine** 386 Equipped *vs.* not Equipped. | Passenger | 5 | Sept. 5 | No Special Equipment. | Detroit to Grand Rapids | 152 | 6 | 265.2 | 403 |
| | | 6 | Sept. 7 | W. N. Hollow Arch<br>Var. Exh. Nozzle<br>Feed Water Heater | Detroit to Grand Rapids | 152 | 6 | 265.2 | 403 |
| | | 7 | Sept. 4 | No Special Equipment. | Grand Rapids to Detroit. | 152 | 53 mi=6<br>99 mi=7 | 288.4<br>314.3 | 466.6 |
| | | 8 | Sept. 6 | W. N. Hollow Arch<br>Var. Exh. Nozzle<br>Feed Water Heater | Grand Rapids to Detroit. | 152 | 53 mi=6<br>99 mi=7 | 292.6<br>318.5 | 470.7 |
| C | | | | | | | | | |
| **Engine** 336 Equipped *vs.* not Equipped. | Freight | 9 | Sept. 14 | No Special Equipment. | Saginaw to Plymouth. | 81.2 | 32.3 mi=44L.6E<br>48.9 mi=44L.8E | 1662<br>1701 | 1369 |
| | | 10 | Sept. 12 | W. N. Hollow Arch<br>Var. Exh. Nozzle<br>Feed Water Heater | Saginaw to Plymouth. | 81.2 | 32.3mi=41L.9E<br>16.9mi=44L.9E<br>32mi=43L.9E | 1683<br>1768<br>1728 | 1394 |
| | | 11 | Sept. 14 | No Special Equipment. | Plymouth to Saginaw. | 81.0 | 31L.4E | 1700 | 1377 |
| | | 12 | Sept. 13 | W. N. Hollow Arch<br>Var. Exh. Nozzle<br>Feed Water Heater | Plymouth to Saginaw. | 82.0 | 49mi=31L.5E<br>33mi=30L.5E | 1715<br>1642 | 1382 |
| D | | | | | | | | | |
| **Engine** 192 Equipped *vs.* **Engine** 197 not Equipped. | Passenger | 13 | Sept. 16 | No Special Equipment. | Detroit to Grand Rapids | 152 | 5 | 238 | 362 |
| | | 14 | Sept. 16 | W. N. Hollow Arch<br>Feed Water Heater | Saginaw Detroit. | 106.5 | 6 | 278 | 296 |

REMARKS.

*Tests 2 and 4, 6 and 8, 10 and 12 and 14 were made using the Wade-Nicholson Hollow Brick-Arch,

†In the type of feed water heater used the air pump exhaust goes into the tank water. It was not con re-evaporated, if measured, would have given a greater evaporation per pound of coal, it was considered age temperature of feed water without heater = 65°. With heater = 84°. No account is taken of quality

‡On account of the quality of fuel in test "14" being very inferior to that in test "13" the per cent. other tests the quality of fuel was comparable.

¶Figured for that part of the test from Plymouth to Grand Ledge only to be comparable with test No.

§The abatement of black smoke, expressed in terms of per cent. of elimination, Hollow Arch over no

ORATION TESTS. ON PERE-MARQUETTE RY.

FUEL SAVING DEVICES. See Remarks.* Aug. 28 to Sept. 16, 1906.

| Total Time in Minutes. | Running Time in Minutes | Average Speed M. P. H. Act. Running Time. | Average Steam Pressure. | POPS OPEN. No. of Times. | POPS OPEN. % of Time. | INJECTOR ON. No. of Times. | INJECTOR ON. % of Time. | BLACK§ SMOKE. % of Running Time. | COAL. Total Lbs. Consumed. | COAL. Lbs. per Sq. Ft. Grate per hour. | COAL. Lbs. per Hundred Ton-Miles. | WATER. Total Lbs. Evaporated. | WATER. Lbs. Evap. per Sq. Ft Heating Surf. per Hr. | WATER. Lbs. Evap. per Lb. of Coal. | WATER. Equivalent Evaporation from and at 212° | % Gain in Evap. Due to Spl. Equip |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| j | k | l | m | n | o | p | q | r | s | t | u | v | w | x | y | z |
| 414 | 336 | 22.3 | 194.6 | 27 | 4.8 | 10 | 95 | 37.3 | 15134 | 48.4 | 10.55 | 120058 | 9.10 | 7.93 | 9.57 | 15.0% |
| 351 | 282 | 26.5 | 193.1 | 23 | 3.4 | 5 | 99 | 17.9 | 11680 | 44.0 | 8.14 | 104062 | 9.41 | 8.91 | 10.58 | |
| 630 | 381 | 20.1 | 191.7 | 28 | 3.9 | 14 | 94 | No record acct. of Darkness | 14089 | 29.6 | ¶ 8.65 | 106283 | 7.11 | 7.54 | 9.10 | |
| 311 | 220 | 20.5 | 191.6 | 8 | 1.9 | 1 | 99 | 24.9 | 8928 | 37.9 | 8.68 | 79475 | 9.19 | 8.90 | 10.56 | |
| 256 | 218 | 41.9 | 202.0 | 62 | 16.6 | 26 | 86 | 62.0 | 15640 | 88.2 | 38.8 | 90500 | 12.0 | 5.78 | 6.98 | 23.3% |
| 238.5 | 216 | 42.3 | 200.8 | 59 | 12.8 | 27 | 87 | 12.9 | 11520 | 70.0 | 28.6 | 82750 | 11.1 | 7.17 | 8.53 | |
| 230.2 | 210 | 43.4 | 193.2 | 24 | 5.7 | 19 | 86 | 68.5 | 16200 | 101.9 | 34.7 | 85000 | 11.7 | 5.25 | 6.33 | |
| 233.0 | 203 | 45.1 | 198.8 | 23 | 4.0 | 21 | 85 | 17.4 | 12848 | 79.9 | 27.3 | 82650 | 11.8 | 6.43 | 7.64 | |
| 517 | 344 | 14.1 | 183.6 | 19 | 9.3 | 28 | 78.1 | 50.0 | 16768 | 35.1 | 12.2 | 107708 | 7.58 | 6.42 | 7.76 | 14.5% |
| 417 | 304 | 159 | 191.9 | 27 | 10.2 | 20 | 79.5 | 21.4 | 15043 | 39.1 | 10.79 | 112200 | 8.94 | 7.46 | 8.88 | |
| 284 | 249 | 19.5 | 181.2 | 6 | 4.0 | 15 | 84 | 65.8 | 11455 | 43.5 | 8.35 | 77300 | 7.55 | 6.75 | 8.13 | |
| 318 | 243 | 20.2 | 183.6 | 10 | 4.2 | 13 | 70.7 | 13.6 | 12037 | 41.1 | 8.70 | 90842 | 9.08 | 7.54 | 8.95 | |
| 299 | 265 | 34.5 | 192.9 | 14 | 7.2 | 35 | 76 | 69.4 | 15067 | 92.9 | 41.6 | 85850 | 8.36 | 5.72 | 6.90 | ‡<br>16.4% |
| 172 | 150 | 42.6 | 190.8 | 7 | 6.6 | 10 | 81.9 | 15.5 | 9075 | 97.5 | 30.7 | 60416 | 10.4 | 6.66 | 7.91 | |

a tank feed water heater and a Variable Exhaust Nozzle.
venient within the province of these tests to measure this condensation, but as the water thus returned and satisfactory to ignore this item and thus insure the results as shown being extremely conservative. Average of steam in these tests.
of gain in series "D" is lower than it would have been had the quality of fuel been comparable. In the

4, which run, for want of tonnage, terminated at Grand Ledge.
arch = , in freight service 65.6%; in passenger service = 76.5%.

West Albany, N. Y., *March* 27, 1907.

*Mr. President and fellow members of the International Railway Master Boiler Makers' Association:*

As chairman on topic No. 3, Arch Tubes and Brick Arches, I beg leave to present to you the following report:

From a test which was recently made with a wide fire-box type of boiler to ascertain the efficiency of the brick arch and arch tubes, the following results were obtained:

The boiler was equipped with four water bars 3-inch diameter, 458 tubes 15 feet 6 x 2 inches, fire-box length 105 inches, width 75¼ inches, steam pressure 200 pounds.

The evaporative power of the boiler is increased 14.9 per cent. by using the brick arch in the fire-box. One-third of this increase is accredited to the water bars, while the remaining two-thirds of the increase must be due to the brick arch itself.

The reason for this increase is perhaps the storage of heat in the brick arch at an advantageous point, near the back flue sheet; the forcing of the path of the flame upward to the crown sheet and on through the upper flues, which are the best heating surfaces of the boiler, and the keeping clear of fuel all the flues of the boiler. Without the brick arch, often fuel is thrown or carried by the draft into the lower flues, plugging them and thereby rendering these flues useless.

It is very noticeable that there is a saving to the flues caused by the brick arch; for, when the fire-box doors are opened, the inrushing air must first come in contact with the hot arch and thereby become heated before reaching the flue sheet.

No doubt the brick arch causes also a better intermingling of the gases and raises their temperature before they leave the fire-box.

To evaporate the same quantity of water, over 14 per cent. less coal per square foot of grate surface per hour need be fired, thereby causing not only a saving of fuel but also a saving in the work of the fireman.

The figures derived from the table of "Average Results," upon which these opinions are based, follow.

From the tables of "Results" and "Average Results" the following conclusions are arrived at:

1. The "Equivalent Evaporation per Pound of Dry Coal," which is the most exact basis of comparison, is the number of pounds of water which would be made into steam at a pressure of 14.7 pounds by the heat from one pound of coal, which contains no moisture if the feed-water had been applied to the boiler at 212° Fahrenheit. This term, then, gives a comparison of the three different arrangements—with brick arch and water

bars—with water bars but without brick arch—and without brick arch and without water bars—all under the same conditions of feed-water temperature, boiler pressure and coal analysis.

With the brick arch and water bars the "Equivalent Evaporation per Pound of Dry Coal" shows a gain or increase of 14.9 per cent. over the arrangement without brick arch and without water bars, and a gain of 9.3 per cent. over that arrangement without brick arch, but with water bars. Therefore, the increased circulation and heating surface due to the water bars causes a gain of one-third of the 14.9 per cent. increase, while the brick arch must be accredited with the remaining two-thirds of that increase.

2. The "Actual Evaporation per Pound of Coal" is the result derived from dividing the total pounds of water evaporated by the total pounds of coal fired.

With the brick arch and water bars, the "Actual Evaporation per Pound of Coal" shows a gain of 13.1 per cent. over the arrangement without the brick arch and without water bars and a gain of 8.4 per cent. over the arrangement without the brick arch, but with water bars.

3. The "Equivalent Evaporation per Pound of Coal" is the result obtained by dividing the total pounds of water evaporated by the total pounds of coal fired, and multiplying this quotient by the factor of evaporation, which factor is gotten from steam tables and which depends upon the steam pressure and the temperature of the feed-water.

With the brick arch and with water bars, the "Equivalent Evaporation per Pound of Coal" shows a gain of 12.9 per cent. over the arrangement without the brick arch and without water bars, and a gain of 8.8 over the arrangement without the brick arch but with water bars.

4. The "Coal Fired per Square Foot of Grate Surface per Hour" is obtained by dividing the total coal fired by the number of square feet of grate surface and dividing again by the duration of the run or test in hours.

With the brick arch and with water bars, the "Coal Fired per Square Foot of Grate Surface per Hour" is 14.7 per cent. less than with the arrangement without the brick arch and without water bars and 7.8 per cent. less than with the arrangement without the brick arch but with water bars.

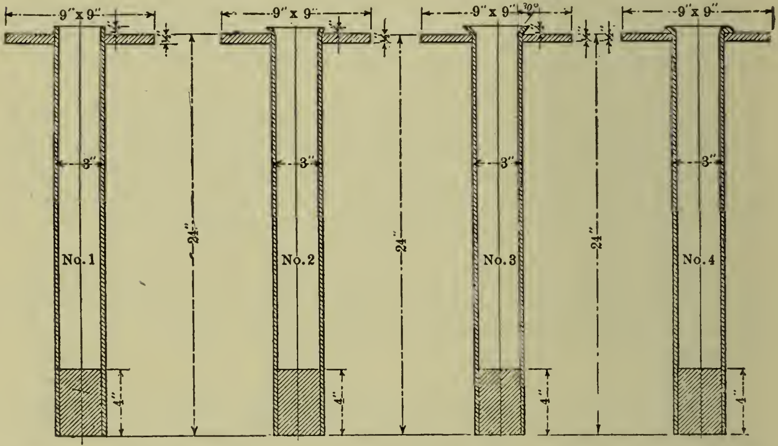
A descripion of the test follows:

The object of the test was to determine whether or not the brick arch increases the efficiency of the boiler; in other words, to compare the evaporative power of the boiler when equipped with the brick arch and when the brick arch is absent.

Since the water bars, which were four in number, increase the heating surface and also the circulation of the water in the boiler, it was decided to make three divisions of the test: with the brick arch and with the water bars; with the water bars but without the brick arch, and without the brick arch and without the water bars. The second division, "with water bars but without the brick arch," was made to determine the influence of the water bars upon the operative power. For every one of the three divisions, three runs were made upon the "Light Throttle" and three upon the "Wide Throttle." The table of "Average Results" is obtained by averaging the results of these three runs for every division.

The method of carrying on the test was as follows:

In order to determine the amount of water evaporated, the tank, or water space in the tender, was calibrated for every half-inch of depth of water. To insure no change of position of the tender it was raised upon screw jacks until the springs were relieved of the load. By means of a glass water column or gauge, which had been fitted to the tank, the water levels were read. Having first filled the tank, the water was permitted to run from the tank into a barrel which rested upon a scale. The scale, having been adjusted to read zero with the barrel upon it, the weight of water between each half-inch level of the surface was read directly from the poise. The water glass scale was graduated to tenths of an inch; the maximum error introduced by the misreading of one-tenth is less than four-tenths of one per cent.



TEST SPECIMENS USED TO DETERMINE THE HOLDING POWER OF ARCH TUBES.

The coal fired was weighed as it was wheeled from the coal car to the tender. A separate compartment was built in the coal pit to hold unweighted coal to be used for banking over the fire and for firing up in preparation for a run.

The feed-water temperature was taken by means of a Fahrenheit thermometer, kept well beneath the surface of the water in the tank.

The temperature of the smoke-box gases was taken by means of a Centigrade thermometer, graduated to 550 degrees, inserted in a brass oil well, which was located on the horizontal diameter at a point midway between the flue sheet and the baffle plate and which extended from the outside half-way to the center of the smoke-box.

Four manometers or draft gauges were used to determine the drafts in the smoke-box, fire-box and ash-pan.

The connections for the two manometers for the smoke-box were located at points about half the height of the smoke-box: one behind the baffle plate and midway between the baffle plate and the flue sheet, the other in front of the baffle plate at a point half-way from that plate to the front end. Both of these connections extended into the smoke-box a distance of one-fourth of its diameter.

The connection for the fire-box manometer was located at a point about twelve inches above the fire and midway the length of the fire-box.

The connection for the ash-pan manometer was located at the center longitudinally and on a line with the dampers.

The main valves were removed, leaving only the valve stems in place.

By means of a trial run, the two notches, upon which would be placed the throttle lever for subsequent runs, were determined and marked. These two notches were decided upon: Partly, by the amount of water that we could safely take from the tank for the run and yet not cut short the length of the run; and partly by the ability of the fireman to fire the required amount of coal.

In preparing for each run, after adjusting all manometers to read correctly, weighing in sufficient coal for the run, filling the tank with water and placing the thermometers in position, we then fired up with unweighed coal until the fire became uniform, the steam pressure constant at 200 pounds and the water level in the boiler was brought to the proper height. Then, at a known signal, with all preparations made, firing from the weighed coal was commenced, the water level in the boiler was marked, the water level in the tank was read and the time was noted. Readings of the manometers, boiler pressures, temperatures and water level of the tank were taken every ten minutes during the run. In order that the manometer readings might be more constant, these were noted for a period of one minute, during which time the fire-box doors were not opened. The overflow from the injectors was caught and weighed and that weight deducted from the weight of water taken from the tank. During the run no more coal was fired than was necessary to maintain a steam pressure of 200 pounds, the pop valves being set at 205 pounds, and for all runs the thickness of the fire was kept as constant as the eye could measure. At the end of the run the water level was carefully kept at that level at which the run was commenced, the fire was kept, as nearly as possible, of the same thickness as at the start and the water level in the tank was carefully read.

In all our narrow fire-box boilers the brick arch is held in position by studs, and in the wide fire-box boiler the brick arch is supported by four 3-inch arch tubes, and to ascertain the holding strength of same when applied in different ways, the following test was made:

Eight test pieces were prepared in accordance with the attached blue print, each specimen having fitted in the lower end with a 4-inch wrought iron plug in order to prevent the tube from collapsing when held in the jaws of the testing machine. The upper end of each specimen was held in position in the machine by means of a plate to which it was applied with roller expander, the same as when applying arch tubes in boiler.

| Test Piece | Tensile Strength | |
|---|---|---|
| Rolled No. 1 | 12,000 lbs. | |
| " " 2 | 13,000 " | |
| Average | | 12,500 lbs. |
| Rolled and flared 1/16″ No. 1 | 23,500 lbs. | |
| " " " " " 2 | 23,800 " | |
| Average | | 23,650 lbs. |
| Rolled and flared 30° No. 1 | 44,000 lbs. | |
| " " " " " 2 | 41,500 " | |
| Average | | 42,750 lbs. |
| Rolled and beaded No. 1 | 48,500 lbs. | |
| " " " " 2 | 42,700 " | |
| Average | | 45,600 lbs. |

G. W. Bennett,
G. F. B. Dept., N. Y. C.

*March* 5, 1907.

*G. W. Bennett, Chairman Committe on Arch Tubes and Brick Arches.*

Dear Sir:—The subject of Arch Flues is one that was given considerable attention several years ago on the Union Pacific R. R. In order that we could find out whether or not these tubes were fulfilling the claims that was made of them. I understand that the first and most plausible claim was that these tubes assisted the circulation of the water. Second, that the heating surface was materially increased and so increased the steaming qualities of the boiler.

From my experience with arch tubes these claims have never been made good. About three years ago at the suggestion of our general boiler inspector, C. L. Hempel, all arch tubes were ordered taken out as the engines came to the shop for repairs. That order was carried out until to-day I don't know of one engine having arch tubes. The water circulates just the same and the steaming qualities of the engines have never been impaired in the least. It cost our company at that time about $75 per engine per year to maintain these arch tubes in addition to the risk of accidents from these tubes bursting and also pulling out of the hole in the flue sheet. The only advantage we got from these arch tubes was that they assisted in holding arch bricks in place; but we substituted a stud bolt with a square end on it and dispensed with arch tubes as a useless expenditure of about $40,000 per year. I might also say that the Union Pacific have no desire to return to the use of arch tubes.

Being now in the service of the Lehigh Valley R. R. Co., I have inquired to what extent arch tubes are being used, and I am unable to find one engine out of our 800 equipped with arch tubes. So, personally, I take my stand with those who say that arch tubes are not necessary in the present locomotive fire-box.

The brick arch opens up quite a large subject, as in order to discuss this we shall be forced into the subject of heat and combustion. Of course I believe, as some other boiler makers do, that the brick arch is detrimental to the life of the fire-boxes, because in our inspection we have always found that most of the cracks in side sheets are directly under the arch; this is especially true of engines carrying 200 pounds pressure or over.

"What is the purpose of the brick arch?" is the question I put to an engineer once, and his reply was that it made the engine steam better. The same question was put to a gentleman whose duties was to go from one end of the line to the other to watch and report the performance of engines in service; his reply was that the brick arch assisted in combustion and was the means of saving a large percentage of coal. His opinion was that there was more money saved in coal than would offset the cost of a new fire-box once every two years. Personally, I am of the opinion that in order to decide on the question of arches we must be guided by the quality of coal that is used, also the district in which the engine does service. Some claim that arches protect the flues from cold air striking them, but I do not take any stock in that, as in our experience we have abundant proof from engines that have no arches where the tubes have given better service than those that had arches.

I believe that where certain kinds of soft coal are used brick arches are necessary in order to get the best results.

Yours respectively,

THOMAS LEWIS,

Gen'l Foreman Boiler Makers, Lehigh Valley R. R.

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KANKAKEE, ILL., *March* 30, 1907.

*Mr. G. W. Bennett, F. B. M., N. Y. C. R. R, West Albany, N. Y.*

DEAR SIR:—In accordance with your request I am sending to you a report of comparative tests of cost of maintenance of brick arches, which I think will be very useful in connection with the subject. This test was made on wide fire-box locomotives, freight and passenger. In addition to this I have had much personal experience which I believe ought to be reserved for general discussion.

Yours truly,

J. GERMAN,

G. B. I.

## COMPARATIVE COST OF MAINTENANCE OF BRICK ARCHES.

| Engine No. | 5001 | 5009 | 4664 | 4670 | 5729 | 5718 |
|---|---|---|---|---|---|---|
| Class of Service | Passenger | Passenger | Passenger | Passenger | Freight | Freight |
| No. of Miles | 6273 | 9152 | 9063 | 11880 | 10669 | 6938 |
| Cost of Brick Replaced | .... | .... | .... | ... | ... | .... |
| Account Flue Repairs | $14.76 | $36.96 | $22.46 | $30.40 | $14.76 | $12.23 |
| Cost of Labor for above | $0.43 | $1.69 | $0.69 | $0.83 | $0.58 | $0.94 |
| Cost of Brick Replaced | .... | .... | .... | .... | .... | .... |
| Account Defective Brick | $0.90 | $23.78 | $12.22 | $12.32 | $4.70 | $1.25 |
| Cost of Labor for above | $0.10 | $1.29 | $0.52 | $0.41 | $0.23 | $0.16 |
| Total Cost of Replacements | $16.19 | $63.72 | $35.89 | $43.96 | $20.27 | $14.58 |
| Cost Maintaining Arch Per 1000 Miles | $2.50 | $6.96 | $3.96 | $3.70 | $1.89 | $2.08 |
| Total Tons of Coal Used | 330.6 | 465.5 | 479.4 | 594 | 1132 | 795.1 |
| Tons of Coal Used Per 1000 Miles | 52.70 | 50.86 | 52.88 | 50 | 107.1 | 116 |
| Cost Coal Per 1000 Miles @ $1.62 Per Ton | $85.38 | $82.39 | $85.66 | $81.00 | $173.50 | $187.92 |
| *9% of Coal Per 1000 Miles | $7.68 | $7.42 | $7.71 | $7.29 | $15.61 | $16.91 |
| Net Amount Saved by Use of Brick Arch Per 1000 Miles | $5.18 | $0.46 | $3.75 | $3.59 | $13.72 | $14.83 |
| Cost of Maintenance of Arch in Percentage of Cost of Coal | 2.9% | 8.4% | 4.6% | 4.5% | 1.09% | 1.1% |

Average Cost of Manitenance of Standard Arches Per 1000 Miles Equals $3.01

Average Cost of Maintenance of Hollow Arches Per 1000 Miles Equals $4.52

Average Cost of Maintenance of All Arches Per 1000 Miles Equals $3.51

*9% Represents Net Amount Coal Saved by Use of Arch Over No Arch.

## COST OF COMPLETE NEW BRICK ARCHES.

| Kind of Arch. | Class of Engines. | Cost of Material. | Coss of Labor. | Total Cost | Amount Hollow Arch Cost Over Standard. |
|---|---|---|---|---|---|
| Hollow | F 51 and G 42 A andB | $9.24 | $0.23 | $9.47 | $4.45 |
| Standard | F 51 and G42 Aand B | $4.92 | $0.10 | $5.02 | ...... |
| Hollow | J40C | $14.53 | $0.30 | $14.83 | $6.47 |
| Standard | J40C | $8.18 | $0.18 | $8.36 | —— |

*Cost of Hollow Arch does not include Cost of Comyustion Tubes.
In Firebox or Cost of Labor of Putting same on.

*Mr. J. T. Goodwin, Sec'y I. R. M. B. M. A., Richmond, Va.*

DEAR SIR:—From a test which we are making at the present time on the New York Central with the Wade Nicholson hollow arch, the following results were obtained and I would be pleased to have you add this to my report:

WADE NICHOLSON HOLLOW ARCH TEST ON THE NEW YORK CENTRAL R. R.

For durability engine 3931 run fifty-three days. Engine No. 3964 now has completed sixty-two days and arch is still in good condition. Engine No. 3913 had a good arch, but was removed to inspect condition of flues and inspect the shell of the boiler. We found that there were thirty-six flues plugged in this engine and no leaks. Nothing has been done to her during this test.

The air passages through the brick have been open in all cases. The flues are better protected by having hot air pass through when engine is standing or not working steam. We advocate as tight a door on the furnace as possible, so the draft from the air pump when engine is not working steam will pump only air through arch and the arch, of course, heats the air in its passage.

We find that the arch will stand a great deal of water thrown on it.

Engine 3898 has side sheet that leaks almost constantly. Engine 3894 had her arch cooled with hose in order to let boiler maker do a quick job on her flues, fourteen times in three weeks.

The engines are all good steamers. They require lighter fire than with the common arch, as so much air is delivered on top of fire that less air is passed through fire, consequently the fire is fanned rather than torn and the smoke is almost entirely consumed.

Less trouble of flue stopping is directly accountable for this fanning of fire with the use of this arch.

The weight of this arch on the water bars is estimated 1,100 pounds, the common arch 1,450 pounds.

Reduced to a mileage basis, the best run made so far with an arch costing $20 per run, compared with the best run known of, with the same make of brick of the common kind is .35 per thousand miles, against $2.35 for the common kind.

It is possible to repair a defective brick in this Wade Nicholson arch. That uneven water bars do not effect the building up of the arch securely. The arch can be put in in fifteen to twenty minutes complete.

The saving of fuel, while all agree that it amounts to considerable, yet a test has got to be made on this road to establish this as a fact, and they are too busy just now to think of anything like that.

Yours truly,

G. W. BENNETT,

General Foreman, Boiler Dept., N. Y. C. R. R.

On motion of Mr. Laughridge the communications were received and the subject opened for discussion.

PRESIDENT SMYTHE—In arranging this program it was planned to divide the honors by giving each association two papers to prepare.

The committee of the Master Steam Boiler Makers' Association were appointed, but through some cause they were unable to make their reports. Mr. Gray wrote me that he was having labor troubles, and he asked the privilege of carrying his subject over until next year, which was "Steel and Iron Flues." Mr. Lowe has, however, prepared a paper on "Boiler Tests." So far as we are concerned, we will have nothing further to present to you. We will now proceed with the discussion.

PRESIDENT HEMPEL—Some years ago we went into the brick arch and arch tube proposition very thoroughly. It has occurred to me that there was not sufficient value in the arch tubes to pay for their maintenance, as it requires an expenditure of $75 per annum for an arch tube per engine; that the arch could be arranged by crowning the arch, even in the wide fire-boxes, 72 inches wide.

Mr. Lewis stated that the Union Pacific had done away with all their arch tubes and found no difference as far as the steaming of the boiler was concerned. He said further:

"We made a crown arch for our wide fire-boxes which has given us excellent service. Then the Wade Nicholson hollow arch was brought out. Of course there is no question but what free air admitted into a fire-box at a temperature above 900 degrees is beneficial so far as the combustion is concerned, but admitted at a less temperature will simply reduce the temperature of the gases and will not ignite. Therefore the Wade Nicholson arch would certainly be beneficial, from the fact that if you can ignite your gases you can utilize them to make steam. To illustrate that one point, we had a boiler over the scrap furnace and great clouds of smoke rolled out the top; we cut a hole in the side of one of the stacks about eight inches square and the smoke was reduced. I kept increasing that hole until I got it about 12x24 inches, and by the time it was that size the smoke had entirely disappeared. I said then that the smoke was gas and was valuable and that we should burn it in locomotive service the same as stationary service. I purchased a boiler for $45, installed it in a plant in which they were using 375 tons of coal a month. I installed a second one and then built a boiler of our own design for the third one, and as a result we are saving this 375 tons of coal. We now run that plant without one pound of coal being used. If any of you visit the Omaha blacksmith shop you will see the same thing there, as nothing but the gas is being used. I do not want to go into the subject of the stationary service, but I want to say that these gases are valuable and if we can utilize them we should do so.

"The brick arch is necessary in locomotive service; it is economical on fuel and I believe the time is coming when the Wade Nicholson arch will be developed to a greater extent and will prove beneficial. It will obviate the smoke nuisance. The brick arch is beneficial, but to my mind there is no necessity of having an arch tube. Many failures are caused by the tube blowing out."

MR. HENNESSEY—On the New York Central we have always had fire brick, both solid and hollow brick. One of our arches, I think, is a benefit to our circulation, and if the arch bars are properly applied there is no danger of their pulling out, that being due to carelessness when putting them in.

MR. D. A. LUCAS—I handled about 552 engines and the most of them were equipped with arch tubes, and it became necessary to remove them all; owing to the bad water district it was impossible to run them. The water boils out of them and the tube becomes red hot and bulges and bursts on top of the bulge. Our trouble was not in the arch tube pulling out; it burst. I made a test on the brick arch. We had eight passenger engines and I took the arch out of one of them and none of the other seven beat that engine. She run fifteen months and made 94,000 miles. When she came in the box was in good condition. I have fought the arch to a certain extent, and my people have decided that the brick arch has no business in a shallow fire-box. We have the wide fire-box and before the engine goes any distance the fire becomes dead up next to the flue sheet. It is detrimental to the engine steaming. I do not like to see this convention uphold the brick arch. I am opposed to it.

MR. LAUGHRIDGE—I can corroborate Mr. Lucas's experience. Where I am we cannot run a brick arch on account of the bursting of the arch tubes. It does not make any difference how an engine has been doing, if we put a brick arch in it will leak before it gets to the other end of the road. We have the shallow fire-box, and we have had the same experience with some foreign engines.

MR. A. N. LUCAS—We had 100 engines equipped with the arch tube and we had fairly good results. Arch brick has shown a saving in fuel ever since it has been in use. We have had very little trouble with our arch tubes giving out. We have had a few bulge on account of the mud. but outside of that we have had very little trouble.

We are using a number of the Wade Nicholson hollow arch. It shows quite a saving over the other kind, and there is less black smoke. We are making a test, and from December it has shown a saving in coal in favor of the hollow arch. Our people are very well satisfied with arch brick and arch tubes.

MR. BURDETT—I am only a small man, in a way, but our people have experimented with the Wade Nicholson arch—used it for a considerable time. Previous to that we had the solid arch, and we are experimenting with another form, but we have found that the Wade Nicholson arch was a big expense from the fact that as quick as a small amount of water fell on the brick arch it crumbled, and you cannot remove and replace the arch. With the old solid arch you could remove it and put it back again. We are now experimenting with an arch that practically covers the whole fire-box.

I am not radical on removing the brick arch entirely, from the fact that in the smoke district you must have something to consume the gas; but I believe if we could devise some means whereby the gas can be consumed without the brick arch, it would be a benefit to all, not only to the men but to the fire-boxes as well, because we know that the brick arch is, in a way, detrimental to the sheet, not only to the sheet but to the flue. The bottom flues become plugged. About two months ago we had an arch tube explode. On one side the arch tube was practically without any water, and on the other side the water was all right. In regard to pulling out of the sheet, I never had one pull out. If they are put in right they will not pull out. If you allow them to roll them and let them go, they will pull out the front sheet.

MR. HENNESSEY—How did you determine that there was no water on the one side?

MR. BURDETT—That is a matter we have not yet determined. We are trying to find out why it was so. One tube was full of water, and on the other side the water was within a foot of the bottom.

MR. HENNESSEY—There was water up to the top of the crown sheet?

MR. BURDETT—Yes. Whether the tube had become so hot that it boiled the water out of it I do not know.

MR. HENNESSEY—Why would there be any more heat on that tube than on the other?

MR. BURDETT—That is what we are now trying to determine.

MR. D. A. LUCAS—In the wide fire-boxes there are four and the two in the center get more heat than the ones on the side. After an engine has gone a certain distance the tubes in the low fire-boxes lay practically in the fire and our tubes come out bulged every six inches, just as though they were made that way. The arch tubes are heated hot or they would not bulge that way. I have had firemen tell me that they became red hot and that accounts for the water being out of them.

MR. BURDETT—About three hours previous to the time the arch tube exploded the steam pipe to the left injector blew off. They claimed that they had water in the boiler. They still claim that they had water in the glass and about three hours after that the arch tube exploded.

MR. TROY—I believe the Pere Marquette has been quoted. I think the data has been collected by the International Correspondence Schools, of Scranton, Pa. I know that in the Saginaw district they have no data on the brick arch. They tried to put them in without the water tubes and they found they could not get crown enough on the brick without bringing them up above the bottom flue, and we never had any arch tube pull out.

MR. LAUGHRIDGE—What class of engine are they? The engine I referred to was a Pere Marquette engine, and we had trouble with the tubes drawing knots on them every six inches from the back end up about half the way of the arch tube.

MR. TROY—These engines were purchased in 1901 and were of the same as those on the Hocking Valley and Lehigh Valley. I do not mean to say we never had any trouble. We equipped six engines with the Wade Nicholson brick arch a year ago, and we have not had any trouble with them.

PRESIDENT SMYTHE—We have a number of valuable papers here, and we would like to dispose of them. It has been suggested that they be read and passed to the Secretary. What is your pleasure?

It was moved by Mr. Hennessey that the discussion close. Carried.

The following paper was read by Secretary Goodwin:

## Paper on Topic No. 2.

*May* 20, 1907.

*Mr. Chairman, gentlemen of the committee, members of the International Railway Master Boiler Makers' Association:*

Topic No. 2, as arranged for at the last convention, is one which, in my opinion, can have great diversity of opinion, and I believe that actual experiences covering a period of years will vary greatly; my experience in handling the different designs of boilers and fire-boxes has been such as to cause me to favor the radial stayed boiler.

I have been handling the Belpair boiler for a period of fifteen years, and in that time I have studied them thoroughly and generally found that after the first twelve months the flue holes in top corners had become elongated one thirty-second inch, necessitating the reaming of same. Before two years the bridges would crack and have to be plugged, flue holes would have to be reamed again, making them two and three thirty-second inches; the flue sheet would also be bulged in center, making it necessary to apply new flue sheet. The life of fire-boxes in this design of boiler is from four to four and one-half years. I firmly believe that the Belpair design of boiler cannot be compared to the radial stayed boiler, particularly the modern design of radial stayed boiler, for in the Belpair there is too much flat surface for boilers carrying 200 and 225 pounds pressure.

The criticism so often heard in regard to radial stayed boilers of "cracking at top of flue sheet" is, I believe, due to faulty construction only, and my reason for saying this is that I have paid particular attention to the upward movement of flue sheets and find that in three years crown sheet will be bulged up three-quarters of an inch in center over flue sheet, while the short radius in corner of same will be in its natural state, thus putting all the strain due to expansion at the top of sheet, causing same to crack just above short radius. To overcome this I would recommend that the flue sheet be given two inches radius when being flanged, instead of one inch, which I find is the practice, and in a great many instances less. I applied flue sheet to one of our large passenger engines carrying 200 pounds of steam with one and one-half inch radius, and after twenty months' service I applied side sheets to same engine and there were no signs of fracture in the top of flange of this sheet; the only noticeable change in this flue sheet was that it was five-sixteenths inch longer from bottom flue hole to top of flange in center than when applied, making the crown sheet appear as if the engine had low water. I would also recommend the applying of Tate flexible bolts, or some other bolt of like design, all over crown sheet and down to the third row below parallel seams of fire-box, thus giving free expansion room to the fire-box when engine is being fired. I think these two changes would not only increase the life of our fire-boxes but also the life of our flues, as it would stop buckling of flue sheets which now causes so much trouble with leaky flues in bottom of sheet.

Yours truly,

J. R. CUSHING.

A MEMBER—Would it not be well to eliminate from the report the word "Tate," as we do not want to advertise any particular make?

MR. HENNESSEY—If we cannot mention the make of the bolt as to what benefit is derived from it, how would these men know? We might mention the design without the maker's name, but I think that was a very good point when he stated that he would apply a Tate flexible staybolt in order to take care of the upward movement of the crown plate. We all know that our flue plates grow. He could have said that he would apply a sling stay. In view of mention having been made of the Wade Nicholson brick arch, it is equally proper to speak of the Tate flexible bolt.

MR. GOODWIN—The Tate people have no better friend than I am. I am fond of their make of bolt, but the word "flexible" is sufficient, and it has occurred to me that it might not be a good idea to mention the name. It would sound all right to the Tate people. This is only a suggestion.

A MEMBER—I think it should be left to Mr. Cushing. If he wishes to mention the Tate flexible bolt he should be allowed to do so. You might recommend that Mr. Cushing erase it.

Isn't there a difference between a Tate flexible bolt and an expansion bolt? Would the Tate flexible bolt take care of the up and down movement? An expansion bolt will take care of the movement three-eighths of an inch. It should be an expansion bolt instead of a flexible bolt.

It was moved by Mr. Laughridge that the reports read be received and that a committee be appointed to select such as should be discussed at this meeting; that the committee report immediately after lunch. Seconded and carried.

PRESIDENT SMYTHE—It is now after 12 and I do not wish to delay you. I will appoint Messrs. Hennessey and Rodgers a committee to select papers to be discussed at this meeting.

Thereupon an adjournment was had until 2 o'clock P. M.

## WEDNESDAY AFTERNOON SESSION.

President Hempel called the meeting to order and announced that as the committee to select papers was not yet ready to report, Secretary Clark would read Mr. Lowe's paper on "Hydrostatic Test of Boilers."

### HYDROSTATIC TEST OF BOILERS.

The writer has had little experience with cold water testing worth relating and is strongly in favor of hot water in preference to cold water testing as being the nearest to the working conditions yet provided; and as the material with which we construct a boiler becomes stronger up to about 600° temperature, the hot water test is not so liable to develop an injury to the boiler, and leaks or fractures are less liable to pass undiscovered.

Cold water testing results in an unusual contraction and is particularly objectionable when the water is cooler than the boiler and atmosphere, as it may result in unnecessary harm as well as render the conditions very uncomfortable for the inspector, who should always insist on a tight boiler; or it would be his duty to suspect that it was improperly constructed should he find seams squirting without being able to satisfy himself as to the cause.

Before subjecting any boiler to excess pressure the factor of safety and authorized working pressure should first be determined. The writer favors one-sixth of the tensile and bursting pressure of a boiler as the safe working load, and considers that new boilers should be subjected to a "proof test" of one-third of the tensile and bursting pressure. Each succeeding year it should receive an excess pressure test of 25 per cent. above its authorized working pressure, and the latter should be considered for reduction at intervals of time not exceeding five years according to its service, condition and pressure, instead of setting various time periods between excess pressure testing; and I do not recommend any specific reduction of pressure at any given age, as I consider the inspector's report should govern.

The internal and external inspections every five years should be very complete, and plates which are affected by decay of any kind should have a portion drilled out to accurately determine the per cent. of deterioration, and thus regulate the authorized working pressure to suit the factor of safety adopted.

As will be observed from my remarks in paragraph 2, I do not favor any discrimination being given boilers at various ages, and recommend an "excess pressure test" annually for all ages.

It has been my experience to discover numerous defects when testing boilers to excess pressure with hot water, and I will explain a few by the following remarks:

1st. The calking on a locomotive boiler, double riveted in the girth seams, could not be made tight at the bottom of the middle course, so it was decided to remove a rivet for inspection of the internal lap, and on discovering the plate section fractured between the rivets it was decided to remove the tubes and get a complete inspection, after which the crack was discovered to be three feet long, thus illustrating the benefit derived from excess testing; as this was a running locomotive and the fracture was hidden, the leak was exposed by the test and subsequent inspection provided a suitable repair before the engine again resumed service.

2d. The throat sheet on a locomotive boiler fractured under excess pressure from the ogee extending almost to the foundation ring. On removal of the defective plate it was discovered that the internal inspection which was made prior to the test could not have exposed the defect, as it was a new fracture about two feet long.

3d. Several longitudinal seams have also failed under excess pressure testing, and in all cases coming under my observation there was a partial fracture of the plate prior to the test, which was hidden by other sections of plate covering them; and it is unlikely that any better means could have been employed to expose the defect than excess pressure testing, and it is my opinion that previous excess pressure tests had nothing to do with the development of these or other fractures, but I do consider that unequal expansion and contraction had; and we are likely to have that evil as long as we build boilers, and it will be a very destructive boiler that does not respond to fluctuating temperatures and pressures.

4th. During excess pressure testing of locomotive boilers we invariably find a larger number of broken staybolts than at any other time, due to the excess pressure separating the partially fractured ones. It has also been a decided advantage to give every locomotive coming in to the general repair shops and on which there is no heavy boiler work expected, an excess pressure test, as all manner of staying is proved to that extent, and the subsequent internal inspection is a further proof when they are not subject to the hammer test.

T. W. Lowe,
General Boiler Inspector, Can. Pac. Ry., Western Lines.
Winnipeg, Man.

It was moved by President Smythe that the paper be accepted and placed in the minutes. Seconded and carried.

PRESIDENT SMYTHE—I would like to hear your opinion on what you consider the proper length of a staybolt to hammer up. We find that the lengths vary, and being engaged in locomotive building, we want to please you all. Some railroad companies want the bolt to extend out a quarter of an inch; others two threads; others two and a half threads. I would consider it a favor if you would voice your sentiments. If you will give your opinions I think it will help.

MR. LETTRI—I would think two and a half threads would be the proper length on the fire side.

MR. KAVANAUGH—We cut it off and set it level—flush with the sheet.

A MEMBER—Our practice on the W. & L. E. is to have two threads.

A. N. LUCAS—We leave two and a half in the inside and three on the outside.

MR. ZIMMERMAN—The head of the staybolt is of no practical value except to prevent a leak, and we follow up the practice of using about two threads, just enough to hammer over a little and prevent the bolt leaking.

MR. PILFER—We use two and a half threads.

D. A. LUCAS—We leave two and a half threads.

MR. HENNESSEY—Our practice has always been to leave two and a half threads.

MR. LATHROP—If the material is soft take a little bit more.

MR. KELLER—I think three threads and two and a half on the outside. If you leave it too short it will buckle.

MR. GOODWIN—My practice is what you want, but it has been my custom and experience that two and a half threads would give better results under general conditions than any length that we can put in. Usually we try to make the bolt fit the hole. I think when we get beyond that we are leaving more metal than is needed. The object of driving a bolt is to upset it in the hole, and the more bolt you have to drive the less swelling you have. I never considered the head on the bolt very strong in making it tight.

MR. O'CONNER—A short time ago I had occasion to remove about 140 bolts from one of our largest engines on account of pulling through the sheet, caused by the small head. I made a thorough examination to see whether there was any mud and found none. It was wholly on account of the small head. We aim to leave two and a half or three threads. We put them in a reversible motor; if it runs in a little too much we set it back. In the bad water district the small head on a staybolt is not the thing to have. You have to remove them too often.

MR. McNULTY—I think if we have the hole proper the head don't make much difference.

MR. GOODWIN—What is the head on a staybolt for?

MR. LETTRI—Some say the head has nothing to do with it. I have noticed sheets corrugate in bad water districts where the hole on the fire-box sheet has been one thirty-second of an inch larger on the water side than on the fire side, and if the head wasn't there the bolt would pull out. They all renew them down where the greatest heat is.

PRESIDENT HEMPEL—I cannot refrain from saying a few words on the subject myself. What is the head on a staybolt for? It certainly is to retain the factor of safety. You all know that any bolt in a fire-box will lose a percentage of its factor of safety as it becomes old. The sheets will bulge, and if you have no head you have lost that factor of safety. You might ask why you put a button-head on a bolt. You do not need too large a head.

MR. GOODWIN—Don't you put the head on to drive it?

PRESIDENT HEMPEL—Surely you do.

MR. GOODWIN—Do you claim that the head amounts to anything?

PRESIDENT HEMPEL—It has a tendency to retain the factor of safety.

MR. GOODWIN—Is it to drive the head?

PRESIDENT HEMPEL—No, sir.

MR. O'CONNER—What do you allow on the Union Pacific?

PRESIDENT HEMPEL—Our practice is a two and a half thread.

D. A. LUCAS—My view of driving a staybolt is to upset it and make it tight in the hole. When you leave over two and a half threads it does not upset in the sheet the way it ought to. I would rather it would be less than two and a half than over. I have to remove a number on account of the sheet bulging below the O. G. bend on account of pulling. If these blots did not have a head on them they would have to come out long before I take them out. When the sheet bulges it injures the bolt. If the head wasn't there the bolts would give way a long while before they do. The head helps strengthen the bolt.

MR. HENNESSEY—There seems to be a difference of half a thread. We have twelve threads to the inch. How much difference is one-half a thread to make on the end of a staybolt? It is one twenty-fourth of an inch. We are giving our valuable time for nothing.

MR. FILSER—Why is it necessary to hammer up a bolt if it is properly applied?

MR. KELLEY—Has any one ever made a test on pulling staybolts with the flush head or no head? How many thousand pounds difference is there between a staybolt with no head and a staybolt with a head?

PRESIDENT HEMPEL—It will break the bolt before it pulls out, with no head. That is my experience, and they have the pieces in the laboratory to-day to substantiate my statement. We pulled them hot and pulled them cold. With a three-eighths plate, secured in the sheet properly, the bolt will break before it will pull out of the sheet. They pull out all the way from 28,000 to 34,000.

A MEMBER—On an inch bolt?

PRESIDENT HEMPEL—No. In making them hot, take the plate and secure the bolt; pull it to about 6,000 with the head on, and to make the bolt good and warm it will pull at about 3,000.

MR. GOODWIN—The more head you have on a bolt the quicker it will pull out?

PRESIDENT HEMPEL—A bolt with a head will not pull out at all. We have failed to pull a bolt out without the bolt breaking. If you find they will pull out it is more than we have been able to do.

MR. KELLEY—How many thousand pounds difference is there?

PRESIDENT HEMPEL—In both cases the bolt broke.

MR. KELLEY—We have had bolts pull out where the thread would be stripped off. A test with the staybolt flush and hammered is as follows: Test 1: Staybolt flush, pulled out of plate at 15,000 pounds per square inch, cold. Test 2: Staybolt with hammered head pulled out of plate at 18,000 pounds per square inch, cold.

The bolt did not break; the head turned inside out. The head never weakened in a cup-head radial stay. The point I want to bring out is that a head on a bolt is of some benefit.

The committee appointed to determine what papers should be discussed before the convention reported the following: "Leaky Staybolts," "Flexible Staybolts," "Cracked Door Holes and Flanges."

## LEAKY STAYBOLTS.

McKEES ROCKS, PA., *May* 4, 1907.

*Mr. J. T. Goodwin, Secretary and Treasurer of the I. R. M. B. M.'s A.*

DEAR SIR:—The following is my report of Topic No. 7:

Best method of looking after leaky stay-bolts.

Stay-bolts will not leak if put in properly, unless in bad water districts or due to mud or boilers not getting the proper care in washing out. Taking care of leaky stay-bolts at terminals, bolts should be held on and hammered up. Care should be taken not to hammer bolt too much, as you will increase size of hole in fire-box, and if you have to remove bolts on account of being loose you will find the hole has enlarged from 1/16 to ⅛ inch more than hole was in the first place. Another good way to tighten leaky bolts is to take a center punch and hold on center of bolt, give it two or three blows with chipping hammer. Another way is to use fuller and rivet tool.

If bolts are leaking very badly and have been hammered several times they should be renewed, as they are not fit to be in high-pressure boilers. If you don't remove them you will find that the sheets will draw heads off stay-bolts. If stay-bolts leak outside of fire-box they should be hammered up, but if leaking through tell-tale hole they should be renewed, as it is a sure indication that there is a flow in bolt or it is broken off. If stay-bolts leak in corners of throat sheet they should be taken out and flexible bolts applied.

Yours truly,
JNO. B. SMITH,
P. & L. E. R. R.

OMAHA, NEB., *May*, 1907.

*Mr. Chairman and Members:*

In regard to leaky stay-bolts: Great care should be taken in tapping out the hole; taps should be kept in good condition and should be cleaned after tapping each hole, so that the boring will not catch and tear the thread. Great care should then be exercised to see that the bolt is properly cut, that is, it should be perfectly straight. Bolts should not be too tight or too loose when bolt is put in and set, allowing two threads for head. A larger head than that allows the bolt to become hot and weakens the same. After proper driving we have very little trouble with stay-bolts; if, after the engine has been in service for a while and bolts are starting to leak, take light hammers and redrive them—being sure to hold them on the outer side. If the bolts continue to leak, would advise that the bad ones be renewed, hole retapped and a new bolt put in. I do not believe in too large a bolt; keep your bolt as small as possible. After bolts become 1⅛ inches the hole should be bushed, reducing the diameter of bolt.

A great deal depends on water conditions. On some divisions of the Union Pacific we never have a leaky bolt and on other divisions it seems impossible to keep them tight with the best of material and best of workmanship.

Yours truly,

C. RYAN,

Foreman, U. P. R. R.

PRESIDENT HEMPEL—I notice one man in the convention who has not attended any of our meetings for a couple of years. Previous to that time he was one of our greatest orators, but lately he is silent, and since this is an important subject we will call upon Mr. J. A. Doarnberger.

MR. DOARNBERGER—I came to listen and profit by the wisdom of others. I do not believe that heat or anything else makes much difference with the staybolt. There may be two threads, two and a half or three threads, but the secret of the staybolt proposition is in the proper application—fitting them properly. I do not believe in a big head, but probably a two and a half thread is our standard for head.

## FLEXIBLE STAYBOLTS.

GREEN ISLAND, N. Y., *May*, 1907.

*Mr. Chairman and Members:*

The Delaware & Hudson Company have 29,183 flexible stay-bolts in service, beginning with the month of Feb., 1905. During 1905 we had 4,806 flexible bolts applied. During 1906 we had 16,302 flexible bolts applied, and up to the present time, 1907, we have 8,075 flexible bolts applied, making a total of 29,183 flexible bolts in use on the D. & H. system. We have not, as yet, found a broken flexible bolt, or are we having any of them leaking. We have found, up to the present time, that wherever we apply flexible bolts we will not have to go to the expense and delay of holding engine to renew again in a few months.

We have some boilers with only 50 flexible bolts. These were the first, and were applied on trial. We have since increased this to 450 bolts per boiler. Believe that all boilers should be equipped with flexible bolts at what is called the "breaking zone." We have found that all the expense there is, is in the first application.

In August, 1906, we had two of our D-3-B class boilers equipped with flexible bolts in place of sling-stays in the second, third, fourth and fifth rows from flue sheet. In December, 1906, one of these boilers was damaged, because of low water. The crown sheet came down 3½ inches, pulling away from 59 head-bolts.. It started at sixth row from flue sheet and effected the sheet as far back as the nineteenth row, making it necessary to renew 125 head-bolts after sheet was put back in shape.

The flexible bolts in crown sheet were not affected in any way, inside or out. Wish to say the flexible bolts were put in on trial in place of sling stays, and up to present time have been very satisfactory in every way. These boilers are carrying 200 pounds steam pressure. All boilers equipped with the flexible bolts are carrying 200 and 210 pounds steam pressure.

At first-class repairs the caps are removed from all flexible bolts. Bolts are examined both with wrench and by holding on one end and tapping with hammer on the other. We have not, as yet, found a broken flexible bolt. When renewing the ordinary broken stay-bolts, whenever possible, we renew with the flexible stay-bolts.

Yours truly,
D. G. Foley,
G. F. & B. I.

PRESIDENT HEMPEL—There seems to be a varied opinion as to how far we should go. Some hold that they should be applied all over; others in the breaking zone.

MR. HENNESSEY—We have had the flexible bolt on the New York Central but a short time, and we are not prepared to say much about it. For my own benefit and information I would like to hear from some of the members who have had considerable experience with the flexible bolt, the manner of testing it and inspection.

MR. FILSER—We have been using the flexible staybolt for four years on the Big Four, and we have had very good results. We stopped the leaking on the inside. We make a full application and also in the breaking zone.

MR. JAMES COOKE—We have some engines carrying 225 pounds pressure, and we found that it was absolutely necessary to put flexible bolts down as low as the bend on the boiler. We often found them broken down to the O. G. from one end to the other. It is best to put flexible bolts almost over the entire end of a boiler carrying that pressure. On other boilers it is only necessary to put in two rows at the top and two rows at the bottom and fill in the corners. We have not found a broken flexible bolt. We take the caps off and sound the bolts, put some graphite on and put the caps on.

D. A. LUCAS—I have had a little experience with the flexible bolt for the past ten years—since we got the first No. 200 engines—and it was the practice to put in the two first rows and across the top. We were using the flexible bolt with the cap and seat. They ran for a year or two and we found from five to twelve or fifteen of them broken. When the cap was taken off the bolt would be found in the sleeve broken off. It was round on the bottom and the company decided to do away with the flexible bolt. In the last two or three years we have been applying a flexible bolt in the corners. We began by putting in twenty-five; that lessened the breaking so much that we have increased it now to 300 bolts. We use a Tate flexible bolt, have had them in service three years, and have not found any broken. We screw the cap off and sound them. A little scale will form in the sleeve, which we knock out, and it gives the bolt free use again.

A MEMBER—How often do you take the caps off?

MR. LUCAS—We take the caps off every time the engine comes in to be overhauled.

MR. HENNESSEY—How do you test the flexible bolt while the engine is in service? The man who made the report stated that they examined the bolt at every general shopping. For instance, if an engine is out from nine to fifteen months, what test do you give the bolts to know whether they are broken or not while the engine was in service?

MR. LUCAS—We haven't given them any test. The boilers ran from the time they first started for three months before we took the caps off the first time. Finally we decided to remove them only every two years, and we have never found any broken. We also use two rows of flexible staybolts in the center rows on top for the sleeve; that gives the bolt a half-inch lift; one-half inch between the bolt head and cap. We contemplated putting two rows across where the T-irons were. At the end of the T-iron they all came down, and also the T-irons, with the exception of the two rows of flexible bolts on each side of the center, and we are getting good results.

MR. McNEVIN—The solid bolt broke first and we took off our cap and applied the flexible flat-head bolt. By putting in the other bolt between them here and there it helps out.

MR. McCUNE—On the Lehigh Valley we have used the flexible staybolt in the breaking zone, but as yet we have not found any broken. But can you call where you apply the flexible bolt the breaking zone? In the past three years where we have applied these bolts we have not found any flexible bolts broken. My opinion is that if we are going to adopt a flexible bolt for a fire-box, why not adopt it all over the boiler? A rigid bolt is bound to break.

PRESIDENT HEMPEL—Would you think that you had determined the breaking zone? You apply two rows on each end down on the corner.

MR. McCUNE—With four rows on each end and four or five rows put on the bottom, we have not found a rigid bolt broken next to a flexible bolt. If we are going to adopt a flexible bolt, why not adopt it all over the fire-box? If you have a flexible bolt all over the fire-box it will adjust itself accordingly.

A. N. LUCAS—Last year we ran 800 engines with 4,424 broken bolts. The year before we removed an average of four and a half or five broken bolts per engine per year. We have applied a number of flexible bolts during the past year which are showing up good so far; but isn't it a fact that on all roads using flexible bolts they are running the rigid bolts and that it is pretty hard to determine the breaking zone? Eventually it will mean a complete installation to overcome the breaking of bolts.

MR. BURDETT—If we apply the flexible bolt in what we call the breaking zone, does not the bolt next to the ones applied become rigid? Just as soon as you apply a flexible bolt to a rigid zone. you then have a rigid bolt next to it and that becomes the breaking zone, and you will find that the bolts will begin to break right alongside of it. As the brother said before, if you are going to apply a flexible bolt to the breaking zone, I think you will have to apply them all over the fire-box.

MR. FILSER—The installation of the Tate flexible bolt would be the proper thing from the top down, forward and back, in place of sling-stays, also bolts with a head on. We have removed the caps a number of times and have never yet found one broken. We have been using a flexible bolt for a number of years.

A. N. LUCAS—If we can apply enough flexible bolts to overcome the breaking of staybolts, they are the thing to put in; but if you apply a few and every ninety days have to take out broken bolts, you are up against it as hard as ever.

D. A. LUCAS—Why do the bolts break in this zone? It is the flanges and the rigid part of the sheet that makes them break. Down in the center of the sheet you seldom have a broken bolt. We had a new engine, bought about a year ago, come in with 115 broken bolts, and we requested that they be replaced with flexible bolts. We have engines received since that engine was ordered that were built with two rows all the way around and across the corners, and on the outside row all the way around the back head and around the corner. On one of these engines, after running six or seven months, I think, we found five broken bolts. The same class of engine without any flexible bolts had 115 broken.

MR. LEWIS—We have had some experience with flexible bolts. We had an engine come into the shop for a new fire-box that had about 400 flexible bolts in the fire-box. After we took off all the caps we did not find one flexible bolt broken in the entire fire-box. It was a large boiler carrying 205 pounds pressure, and we had to drill every bolt on the inside of the fire-box in order to get them out. I think the flexible staybolt is the proper bolt for overcoming the difficulty we have had in the past years on account of broken staybolts, and my orders now are to apply the flexible staybolt in all boilers carrying 175 pounds pressure or over. We are at present making a test.

MR. GOODWIN—Does that mean all bolts to be flexible?

MR. LEWIS—No, just in the breaking zone. We have a blueprint showing where they are to be applied down both sides, five rows from each end; five rows from the front end and five rows from the back end, and the third row from the mud-ring up. I am speaking of the Mother Hubbard class of engines with the wide fire-boxes. They are extensively used on the Lehigh Valley. We had some engines come in with T-irons on. I left them off and put in four rows of flexible staybolts, and the only defect we feared was that it might not be strong enough in the crown sheet. We allowed two and a half threads and riveted them over.

MR. HENNESSEY—How long had that fire-box been in service?

MR. LEWIS—I could hardly tell you; the bolts were applied in the factory when the engine was built.

D. A. LUCAS—He stated that when the engine came in he removed all the caps and found none of the flexible staybolts broken. Did you find any of the rigid bolts outside of them broken?

MR. LEWIS—I cannot answer that. I did not observe any. We can usually see on the outside from the tell-tale hole. I would not be sure about that because we did not inspect for broken staybolts.

MR. LETTRI—I would like to know if any one found the sleeve broken? That has as much to do with it as the bolt.

MR. CUSHING—I have been handling boilers with flexible staybolts for about fifteen years, and we have removed a great many fire-boxes. I never found but two of them broken. They had eight bolts in the top corner of the fire-box. I have repeatedly removed the rigid bolts. There was one engine that was sent over to Delaware to have a fire-box put in it. I requested them to report to me, and they reported back that after five years none were broken in the top corners.

### Radial Stay *vs.* Belpaire Boilers.

D. A. LUCAS—This is a very deep subject and it is hard to determine which make of boiler will give the best results at the least cost, under all the different conditions and circumstances by which they come in contact with the different kinds of water and localities. The Belpaire boiler in my locality, the C. B. & Q. west of the Missouri River, is by far the best boiler, cheaper maintained and is a great deal more serviceable. We have had Belpaire boilers in service sixteen years without renewal of fire-box; also the crown stays last six months and a year longer without renewal than in the radial stay boiler. The average life of a fire-box in a radial stay boiler is from two years and six months to four years, in boilers carrying from 160 to 200 pounds pressure. This is a great saving in favor of the Belpaire.

There is no comparison in the durability of the flue sheets in the two different boilers. The life of the back flue sheet in a radial stay boiler, with the flue hole two inches in from the heel of flange to center, was as short as five months when it had from two to four cracks from flue hole to rivets. We began removing them when they were six months old. The Belpaire sheet will last from two and a half to three years without giving any trouble. We have removed an average of six flue sheets from radial stay boilers to one from a Belpaire. The boilers in our locality cover a large territory, and in the bad water district, where the water is of a foaming nature in the boilers, the Belpaire carries the water much better than a radial stay boiler.

I was chairman of that committee, and I tried to get the committee together, but it seemed impossible. Mr. Cushing was the only one who responded.

PRESIDENT HEMPEL—The paper read this morning written by Mr. Cushing was a very good one, and possibly as good as if prepared by the entire committee.

MR. MORRISON—For the benefit of those who did not hear the paper, would it not be advisable for the Secretary to read it again?

Thereupon Secretary Goodwin read Mr. Cushing's report.

MR. MORRISON—I take exception to the paper in this respect: Where I am located we have ten of the Belpaire boilers, and the only dissatisfaction that we find with them is in the shoulder sheet outside. We get better than twenty-one months' service out of the engine. The water is exceptionally good in the North where I am located.

MR. LAUGHRIDGE—I would like to hear from Mr. Lettri.

MR. LETTRI—It would be very hard for me to say much on the subject, as I haven't much information on the radial, so, of course, I could not draw any line. I have noticed one defect on the Belpaire boiler, and that is between the first two rows of crown stays on the roof sheet where they have an expansion sheet.

A MEMBER—What sized sheet do you use for the roof sheet?

MR. LETTRI—Seven-sixteenths.

D. A. LUCAS—Some received new boxes in a little over a year on account of the flue sheet cracking from the top flue holes and on the side seams in the fire-box. The Belpaire side seams never give us any trouble, and it was impossible to keep the side seams in the radial stay boiler from leaking. When one high-class passenger engine was a year old the side sheets were removed. They lapped a different way and the fire butted up against them. We lapped them outside of the crown sheet the way they should have been and we obtained better results.

MR. GOODWIN—Do you claim that is a benefit?

U. OF ILL. LIB.

D. A. LUCAS—The crown stays in the Belpaire boiler do not have to be removed nearly as often as in the radial stay boiler.

MR. GOODWIN—Don't you think that is because of the placing of the holes so close to the flange?

D. A. LUCAS—That may have something to do with it. We have about half radial stay and half Belpaire.

MR. LAUGHRIDGE—I would like to ask if you do not have trouble with the radial stay with the outside row, finding the hole cracked on the water side, the crown stay holes—on the Player improved, radial stay? That has been my experience, while with the Belpaire boiler we can leave the crown sheet in and it will run two sets of side sheets, flue sheets and door sheets.

MR. LETTRI—I said awhile ago that I did not know much about the radial stay, but we have a few, and I think you will find the trouble where the row of stay bolts comes into the crown sheet.

A MEMBER—We have no trouble with the seam on the Belpaire.

D. A. LUCAS—We have some of the old class A type with a rivet in between the staybolts; then staybolt and rivet. They burn away and give trouble.

MR. HENNESSEY—We have a few of the Belpaire and a number of the radial stay boilers on our division, and I do not know that we have any more trouble with the Belpaire than with the radial stay, only in the seams, as stated by Mr. Lucas. Where the fire-boxes are in three sheets we have trouble with the seam. A new engine may come in inside of four or five months with the rivets commencing to work, and they have to be removed—all of the rivets in the side sheet seam. They crack around the flue hole, around the flange up to the rivet hole. It is almost impossible to keep the side sheet seams from leaking. We have driven the rivets by hand with a pneumatic hammer to see if it made any difference, and the hammered rivets don't seem to hold any better than the machine-driven rivet. On the Belpaire the greatest trouble is with the scale. It has the flat crown sheet with the center radial stays four inches apart; between each one of these radial stays there are two cross-stays which make pockets for the accumulation of scale.

## Fire-Door.

MR. CONNOR—It would be hardly expected that I would say anything against the Connor fire-door, but there are others here who have had experience with it, and I would like to hear from them. One thing I can say, and that is, everybody knows the trouble that a crack around a door flange will cause. We had so much trouble with that in our country that it set me to thinking to devise some method of eliminating it. About 1900 I began experimenting with this door. I had success with the experimental ones. I found it was a good thing and I protected it.

We have had on the Northwestern system, during the past four years or over, more than 400 locomotives equipped with this door, thirteen divisions all told, and we have never yet applied any expense whatever to these doors. In the year 1902, when I was experimenting with this door, I notified the boiler makers west of the Missouri River to keep an accurate expense account of the labor and material that was expended on these flanges alone. They sent it in from time to time. We had 104 engines on that division, and the average expense on a locomotive during that year was $13.57; $13 per locomotive from the defect of the door alone. What could we figure on a railroad having 1,000 or 1,500 engines?

I have one of the doors here if any of the members would like to see it. I do not intend to talk about it myself very much, for I am not going to say anything bad about it. It has proven such a success that it has not given me any room to say anything against it. We have satisfactory reports from the railroad managers and superintendents of motive power that have used the door. On the Great Northwestern system they have about the hardest water of any road in the country. Mr. Emerson, the Superintendent of Motive Power, applied one of these doors three years ago in September, and a short time ago he reported to us that he was going to equip twenty of his locomotives. The M. K. & T. is applying them to all its shop engines—all engines going through the shops for general repairs. The D. & H. has fifty-one on and twenty-five more ordered. Others have ordered, and it is giving entire satisfaction and eliminating the cracking of doors. I would like to have any oue who has not seen the door look at it and give their opinion. A great many roads are using the door that haven't any representative here. Your president is familiar with the door.

PRESIDENT HEMPEL—We all have more or less trouble with cracked fire-doors. On our road we have as much as others, and probably more. Often it is necessary to put a collar all around the door. I was rather skeptical for two or three years in regard to the construction of the Connor door. I knew that the Northwestern was using these doors and that it was not necessary for us to experiment as long as our neighbors were doing so. I watched it very closely and found that the Connor door, as applied, has practically done away with the cracking of the door. Mr. Quayle recommends it very highly. We should have some way of overcoming the cracking of fire-doors, and I know of no other way except through some such means; by increasing the flange to a larger radius, making it more easy and giving it a better circulation. That is the way I understand the door. It has impressed me very favorably.

MR. SMITH—I have had the Connor door in use for over a year, and we have never had any trouble with the door cracking. Our master mechanic has notified me that all new engines would be equipped with the Connor door. I think we have overcome all our troubles of the past.

A. N. LUCAS—We have recently applied two of the Connor doors. They have been in service six or eight months and are making good so far.

MR. DOARNBERGER—I have noticed that Mr. Connor's door is very good. We have the greatest amount of trouble with doors in what is known as the Y. W. Two years ago I put in what was called an O. G. door, the old Hinkle door. We have been watching it closely and it has given entire satisfaction. I had to roll the sheet clear to the mud-ring.

A MEMBER—What is the radius?

MR. DOARNBERGER—It is eight and a half inches. It certainly has overcome our cracked fire-doors. It is simply an O. G. door and is giving satisfaction.

MR. FLAVIN—I would like to ask whether Mr. Connor's patent covers the operation of increasing the back head the same as the back sheet? I have always felt that Mr. Connor has been done an injustice. I visit a number of railroad shops and I find in many instances that others have been benefited by Mr. Connor's experiment by dishing the back head. I think the patent ought to cover that point.

Someone alluded to a patch. I never saw a fire-door cracked on the bottom in my life. Why should the patch cover the bottom of the door? I have probably applied a thousand door patches on roads where fire-boxes last twenty months, flues last ten weeks; where it was bad water and cold weather, and the entire door collar patch is wrong. While you do have to flange, providing six or seven rivets are left, the patch gives better satisfaction without covering the lower section of the door. I do not know whether it is a matter of expansion or not, but a fire-door collar that includes everything but five or seven rivets on the bottom will undoubtedly give better satisfaction. The Connor door has covered all of these matters, and I only regret that Mr. Connor did not include the dishing of the back head.

MR. BEST—We have with us to-day D. A. Foley, who, I understand, has put in a great many Connor doors, and I would like to hear his opinion. One time when I called upon him he said he had all kinds of trouble with cracked door sheets.

MR. FOLEY—I can add nothing to the report this morning.

MR. KELLEY—I cannot add much, but I can say that after four years the door is all right. It is the best thing I know of.

MR. FLAVIN—I am not speaking of the new fire-boxes; I am speaking of the old door hole. I do not believe that there is a man who has had the fight that I have had with them. I knew that three months would be the limit, but with the fire extending around the sheet it would be impossible to stand it at all. In regard to the Connor door, my remarks were to call Mr. Connor's attention to the fact that he should protect his patent and include the back head in the Connor door hole.

PRESIDENT HEMPEL—It seems to me that a patch applied as you state, leaving a part of the metal on the bottom, would be better than to take out the entire door hole.

MR. CONNOR—About dishing the back head, that has already been taken into consideration. Another point I wish to make is that the Connor door can be applied to any locomotive regardless of the shape or form of the door without any change in the back head. If the head is changed there is considerable labor and expense.

A. N. LUCAS—I do not think we would get the same results by dishing the back head because it is five-eighths or eleven-sixteenths thick.

MR. GERMAN—Four years ago I picked up a journal and I saw this Connor door. I did not know at that time who had the patent, so I thought I would try it, and it has been in service ever since. It carries 165 pounds of steam and there is not a fracture in it up to the present time.

*Mr. Chairman and Members:*

The Delaware & Hudson Company have 471 locomotives on their main lines; 328 of which are of the Wooten type, which have on oblong door-hole 12½x36 inches. The bottom of this door-hole is only 7 inches above top of grates. It will be readily seen that this door-hole flange is subjected to a constant strain of expansion and contraction, due to being so low, and being partly covered with fire.

After our Wooten type of boilers are in service eight to ten months our troubles commence with door-hole flange cracking, and it is remarkable that instead of cracking on the top side first it is the bottom. These cracks start at heel of flange or knuckle, cracks being only about ½ to ¾ inches long when they begin to leak, which we then plug. These cracks gradually work into rivet holes in flange and down the door sheet.

Finally, after being in service about fifteen months, a patch has to be put on 7x28 inches, on the bottom. After boiler is in service about two and one-half years a patch has to be put on top of door-hole. The patches have to be renewed after being in service as long as before being patched, as they crack in heel of flange just the same as original sheet. These cracks are not due to mud or poor water; we have very good water.

We can get from 80,000 to 100,000 miles out of a full set of flues, and about 45,000 miles before renewing the lower flues. Our fire-boxes last from ten to twelve years, and we run forty days, or about 6,000 miles between washouts. Have not as yet found a case where our door holes were mud-bound, or any cause for our door-holes cracking. other than expansion and contraction.

In order to overcome the expense, delay in holding engines in shop for repairs to door-holes, and engine failures due to door-holes leaking, since May 1st, 1906, we have equipped 51 of our Wooten type boilers with the O'Connor Improved Door-hole Flange. The 51 boilers equipped with the O'Connor Improved Door-hole Flange are carrying a steam pressure of 200 and 210 pounds. They are scattered all over the D. & H. system, and are in all kinds of service. They have not, as yet, cost one cent for repairs to door-hole, and not one of them have, as yet, developed a defect of any kind. The principle of absorbing the expansion seems to be correct.

Yours truly,
D. G. Foley,
G. F. & B. I.

PRESIDENT HEMPEL—If there are no others to speak we will go to the discussion of Shop Practices.

MR. FLAVIN—I do not believe in hurrying the closing of the convention. Men are here from a great distance and they do not expect to bring their families and get through in two days. Many subjects have not been touched upon. Boiler explosions should be discussed. In a body of steam boiler makers, what more fitting subject could there be? And I will venture to say that if every man here gave his experience this convention would not close till Saturday. Another thing we must not forget, and that is that this is a convention of Master Steam Boiler Makers, a new organization. It is one that future conventions will refer to for authority like the first Congress of the United States. We want our deliberations governed by such judgment that future conventions will refer to the Cleveland convention.

PRESIDENT HEMPEL—This is, as you say, a most important convention, but the most important of all is to complete the amalgamation of these associations. Boiler explosions is a good subject, but it should be brought before the convention with a proper paper, which will be done if you present that subject for next year.

I will appoint as a committee to audit the books of Secretary and Treasurer Goodwin, Messrs. Kavanaugh and A. N. Lucas.

## Shop Practices.

MR. HENNESSEY—Under the head of open-shop practices I notice that we have no paper on the old important question, "Leaky Flues." At the present time I do not know that any more important subject could come before this meeting than leaky flues while engines are in service. On the Western division of the New York Central we have never had as much trouble with leaky flues as during the past winter and spring. I would like to have different members from roads that are in the habit of using the Prosser expander state their practice over the road. I mean taking care of the flues while the engine is in service. It is a point that I am interested in and I would be much obliged for all the information I can get on the subject of flue failures while the engines are in service and the care of the locomotives both on the road and at terminals.

We all set our flues in the shop as well as they can be set. I think they are almost welded in the sheet, but it is difficult while the flues are in service. On roads where they have good water they do not have that trouble, but with scale like I have shown you, what can be expected?

MR. CONNOR—The result of the service that we get from the flues after they leave the shop will depend greatly on how they were applied in the shop.

It was moved by Mr. Hennessey that before the convention adjourned it take into consideration the subject of flues. Seconded by many voices and carried.

The President appointed Mr. Hennessey and Mr. Burdett as a committee to prepare a paper on flues.

MR. KELLEY—I want to ask how far the flue hole should be spaced from the flange on top of the radial stay boiler, Belpaire or circle top?

MR. FLAVIN—When new flue sheets are applied, the flue holes should be laid out equidistant from each other, the intervening sections of Bridges to be not less than ⅞ inch.

The upper edge of the top row of flue holes should not be less than 2¾ inches from the base or foot of the flange and the flue sheet. This overcomes to a great extent the tendency of the upper flue holes to crack.

The copper ferrule should be of reasonable thickness, either a No. 16 or 14 gauge, No. 14 preferred. I have always received better service from No. 14 than from No. 16.

The copper ferrule should be shorter than is usually used, the width to exceed the thickness of the sheet ⅛ of an inch, this to protect the flue from being cut on the sharp edge of the flue sheet, during the process of "Prosser Expanding."

In all cases where it is possible, the Prosser Expander should be used instead of the roller during the operation in setting the flue—this to be done before those flues are turned over, and except in the case of the oblong holes, the use of the flue roller should be dispensed with in the actual process of setting the flues. It is absolutely necessary, however, to use the Roller Expander in oblong holes.

The Prosser Expander should be operated by a long stroke riveter, or jam riveter, and in either case, two men should be used in this operation, as there is time saved and better work insured, and the self-releasing Prosser or Sectional Expander should be used, of which there are two very good ones on the market.

When the locomotive is placed in service, and the flues are found to be leaking, the Prosser Expander, and a light pneumatic hammer should be used in tightening, except where the flue becomes loose in the hole, or where the water used is of such a nature that it has a tendency to crystallize the flue, in which case it is absolutely necessary to use the Roller Expander. In such cases rollers should be operated with air motor, for both the process of turning over and bearing the flue be by "Air."

The bead of the flue will, of course, vary in size, according to the thickness of the ferrule used.

In the maintenance of the flues after they are in service, a standard beading tool should be used, the same to be made to template and dressed or filed in tool room.

The standard thickness of the flues should be No. 11 gauge, as I have found that No. 12 gauge flues do not last as long as they should, while a No. 10 gauge flue will, in bad water district, give trouble in a very short time. The ideal condition would be a No. 10 gauge flue, with a No. 11 gauge safety end welded on.

MR. KELLEY—I want to ask how far the flue hole should be spaced from the flange on top of the radical stay boiler, Belpaire or circle top?

D. A. LUCAS—Our practice is three inches for a two-inch hole, and three and a half for a two and a half. With new flue sheets, where the flues are already in, we leave out twenty-five flues around the outside edge of the sheet and plug the front flue holes, but we do not put a hole in closer than three inches to flange.

Thereupon an adjournment was had until Thursday morning.

## THURSDAY MORNING SESSION.

President Smythe called the meeting to order.

The following paper on "Flue Welding and Setting" was read by Mr. Clarke:

### METHOD OF WELDING STEEL FLUE ENDS TO STEEL FLUES.

CEDAR RAPIDS, IOWA, *March* 27, 1907.

*Mr. President and members of the Association:*

In taking up this section it will be well to mention that twenty months previous to above date a certain company sent a representative to Cedar Rapids to demonstrate how to weld a steel flue end on steel flues.

Furnace was ready for action with every care possible. The demonstrator started to weld *steel viz. steel* together. After trying about twenty applications he decided he had not the right material to flue ends, so sent to their respective office to have more flue ends sent forward by first passenger train.

On arrival of their special order it was again given a thorough test, with same results as before. Among the many flues welded there was not a flue that could be passed as first-class. Several were welded and placed under hammer and one or two vibrations separated them, which showed that flues were not welded at all, but presented a very neat job of shrinking, that is, every indication went to show that the flue end was merely a shrink on flue. When complete it had every appearance of being welded from outside.

Considerable stress can here be laid to the composition of metal in this respect after a very severe white heat (a heat necessary to weld a flue). After being welded we found several flues which showed signs of being overheated, and they were indeed like a piece of cast iron. All ambition of metal seemed to leave, which was afterwards decided as being too much carbon leaving practicable cast iron.

Of all the ends that were furnished to demonstrate the quality for welding steel to steel, we had but a small margin, if any, that could pass inspection.

After the departure of the demonstrator we decided to try the welding of iron flue ends on steel flues. I must say that we had some very flattering specimens, sufficiently enough to warrant using them in one of our engines, which, to my knowledge, never gave any trouble other than that received in ordinary service. Afterwards a full set of steel tubes were applied, in what is known as our 20-B class engine, Engine 1001, which received full set of steel tubes 10/05, went to shop 12/06 for fire-box, which developed fourteen months' continuous service, during which time a great number of beads became defective, and after exerting every effort possible flue plugs had to be driven in them in cases of emergency (which is not a general practice). During the fourteen months' service of this engine the mileage run up to 43,415 miles, which is not very good for this class of power, it being of wide fire-box type, containing 306 two-inch tubes fifteen feet long. As above stated, we have not had a very good mileage with a steel flue and not a success of welding a steel end on a steel flue.

## METHOD OF SETTING FLUES.

The method in vogue at this point is as follows:

After the removal of all flues from boiler the flue sheet is thoroughly inspected, and if a burr is discovered from excessive calking of flues while in service, same is reamed out of hole, after which 40-ounce copper ferrules are rolled in sheet to fit swedge of flue.

I might state here that we have a standard size of swedges from 1—2—3 which covers all sizes of flue holes from $1^{15}/_{16}$ to $2^{1}/_{16}$ inches.

The number of swedges, together with length of flue, is then given to flue welder. After receiving flues they are put in boiler mandrilled out to sheet, after which they are expanded with a Prosser sectional flue expander, flue turned over with device we have to fit long stroke hammer, then rolled not too heavy, and last application to calk them.

We have had a very good success with this method of flue setting.

## COMPARISON OF IRON AND STEEL TUBES IN SERVICE.

In the last year on our Colorado division there has been a series of tests made as to the efficiency of the steel tube. On one-half of flue sheet and iron on one-half of flue sheet, which has resulted in service of no difference whatever in furnace end.

As to pitting of flue or any other inflation which might occur to body of flue in boiler, at present I am not in a position to say, as flues are still in service and careful inspection will be made when they are removed so as to determine their quality.

Respectfully submitted,
B. S. MORRISON,
Boiler Foreman.

MR. LESTER—What success do you have driving staybolts with a long-stroke hammer?

MR. LUCAS—We have until lately been driving our staybolts with a No. 80 hammer. We get good results. We use the same gang that drive by hand. We drive 800 in ten hours.

Question: Does that mean one end or both ends?

Answer: That means 800 ends. We have a gang outside and a gang inside. We can drive 100 ends an hour. We have had them in service three years and they are just as good on the inside. They do neat and rapid work.

Question: Does it upset the bolt in the hole properly?

Answer: Yes, I have cut them in half to see how they were upset.

Question: What percentage of upset do you get?

Answer: Just according to how long you stay on. It is not advisable to stay on a bolt longer than necessary.

Question: What device have you for holding on?

Answer: We use an air holder-on. We have a flat die and we also have a staybolt die.

Question: Do you drive the inside first?

Answer: No, we drive the outside first. We do all our work down-hand, all hammer work; one gang inside and the other on top.

Question: What do you do when you have an O. G. boiler?

Answer: We just tap it a little bit and drive it the same way.

MR. GOODWIN—Do you use a tell-tale hole in all boilers?

Answer: Yes; I can get a cut of the die and pass it around.

D. A. LUCAS—I have been using this same die for two years past, and apply all the bolts in new boxes with the same staybolt die. I use a No. 5 Boyer, which upsets them good. I have made tests, driving them one side by hand and the other side with a hammer and die, and the result is in favor of the die-driven bolt. It upsets and crowds it into the hole better than by hand.

Question: Do you have plenty of air?

Answer: I have 100 pounds of air and hold on with a pneumatic holder-on.

Question: Do you have a limit to the amount of pressure?

Answer: Our air varies from ninety-five to one hundred pounds.

Question: Would you recommend it at seventy pounds?

Answer: I have driven at seventy pounds, but I would rather have one hundred pounds of air. I have engines that have run a year with the box driven by air, and I have others that came in with fifty or sixty, and I redrive them. The only thing to be particular about is the length of the bolt; you do not want to get it too long for the die. I have a gauge which is slipped over the ends so that the two stays hit the sheet. We lay our boilers down and drive all down-handed, with a couple of horses on each end; one man stays at one end of the box with the holder-on, and one in the center with the hammer and they work away from each other.

Question: What kind of water have you?

Answer: Bad, very bad.

Question: How long do your flues usually last?

Answer: It depends on the class of engine. They last from eight to ten months.

A MEMBER—That is pretty fair water.

MR. LUCAS—No, we have some of the worst kind of water for foaming.

MR. McCUNE—How are the staybolts cut off?

Answer: All my bolts have the tell-tale hole drilled one and one-eighth inch deep at the machine, and is niched to five-eighths and cut to length in the machine. A man screws them in and breaks them off on the inside. The tell-tale hole is very easily pinned out.

Question: In driving the bolt with the air hammer, after the tell-tale hole has been drilled, what do you find the swelling of that bolt after driving with the hammer—the difference between that and a solid bolt? I find that the hammer will upset and swell the bolt, and if you pound it long enough it will upset the bolt between the sheets.

Question: You do not find that the bolt will swell to the end of the hole?

Answer: No, the center of the die is one-sixteenth of an inch longer than the outside edge of the die.

Question: Do you ever experience any trouble splitting the bolts?

Answer: I have not yet.

A MEMBER—We find quite a number split.

D. A. LUCAS—Our bolt is solid on the inside where the trouble generally occurs.

PRESIDENT SMYTHE—The committee is ready to report on the maintenance of flues.

The following report was read by Secretary Goodwin:

*Mr. President and gentlemen of this convention:*

The committee appointed by you on the subject of the best method of applying flues, also the best method of maintaining same while in running service, both on the road and at terminals, would like to have each and every boiler foreman give his experience as to the best methods and best tools to be used to get the best results. Knowing that every railway official on all railways at the present time is deeply interested in this subject, and believing that they have their eyes on this convention, we believe we can all of us derive a great amount of benefit by listening to the experience of others, and would recommend that this subject be opened for discussion.

(Signed) E. J. Hennessey, N. Y. C. R. R.
T. Burdett, C. & N. W. R. R.

A. N. LUCAS—I will tell you how I do it. I believe the hole should be smooth; the burr should be taken off on both sides; the copper should be put in flush with the fire-box side; it should come in with a tight fit and not have to be driven with a sledge. It should be put in just far enough to allow the proper bead. To hold the sheet in position it is well to turn the bead over; take the face of the hammer and hit the flue a few blows. When the last flue comes in they are all ready for expanding. Turning the expander four times half the width. You are not working your sheet half as hard if you use a five- or six-pound maul. I believe we ought to work from the elbow and not take the body swing at all. We bead our flues, using no roller at all. We use a backing hammer, turning the expander twice or three times, always going light on it. We are getting better than 100,000 miles and we have had as high as 230,000 miles in our heavy passenger service. Two to three years' service between flue renewals.

The greatest trouble we have in boiler work is the care of the flues in the roundhouse. Too much attention cannot be paid to the boiler makers working the flue in the roundhouse. They are allowed to go in the fire-box and pound away with any kind of a maul, sometimes using an expander that goes in one-eighth of an inch farther. We claim that we should use an expander some shorter on repair work, so that it will go in the original recess to the first setting, which will tighten the flue in the sheet.

PRESIDENT SMYTHE—State what kind of water you have. Brother Lucas claims he can get two years. I have seen places where you cannot get but six months.

MR. LUCAS—I must say that we take very good care of our boilers at terminals, in the roundhouses and on the road. We use considerable soda ash, and we seldom find scale between the flue. We have six wash holes and wash from the front end, over the crown sheets.

MR. KAVANAUGH—What is meant by retubing? We are running locomotives, but we are not getting any such mileage as that. Possibly we could get 200,000 miles out of the top flues.

A. N. LUCAS—It is not our practice to recommend a half set of flues. We get as high as thirty months' service before we take a flue out of the boiler. If we take out more than forty we renew the set. We do not make a practice of renewing the bottom flues at all.

MR. TEJNAN—What flue are you using?

Answer: We are using both kinds, steel and iron. We have some that have been in service thirty-one months.

MR. TEJNAN—We have had experience with the steel tube. The best we can do in bad water districts was three to four months with the iron flue; with the steel flue we had from five to six or seven months. The water is bad.

Question: How do you find the pitting on steel flues?

Answer: We do not use the entire steel flue; just the steel ends.

A. N. LUCAS—We have considerable pitting with the iron flue. The last few years the iron flues pit considerably and we have been making some tests. Our chemist says there is some steel in them. They are semi-steel.

MR. LEWIS—I would like to ask Brother Lucas how much he allows for the bead?

Answer: Scant quarter.

Question: What kind of a Prosser expander do you use; with a shoulder on?

Answer: With a shoulder on for new work.

MR. HENNESSEY—I notice a great many of our members are asking Mr. Lucas what he does. I do not hear any of these members say what they are doing. We brought this subject before the convention so that every member could express himself. We should get down to business and know what each one is doing. We are only getting Mr. Lucas's idea of his way of working the flue. Let us give our ideas, so Mr. Lucas will have the benefit of our experiences.

MR. GREEN—In speaking of the life of a flue, I believe it is due a great deal to the thickness of the sheet. I have found out that engines with five-eighths flue sheet would run possibly four months and then begin to burn the heads off, and in the same district a half-inch sheet would run longer. It is not so much in setting the flues, because most everybody uses a Prosser expander anyway.

D. A. LUCAS—I have had considerable experience with flues and have treated them different ways. Our present method is filing the flue hole to a radius of one-sixteenth of an inch on each side and applying a copper ferrule flush with the sheet on the fire side. We use an inch long ferrule.

I would like to ask where the flue leaks: between the flue and the copper, or between the copper and the sheet? I made an examination once and found that it leaked between the copper and the flue. The copper shim is rolled into the sheet and the flue swedged one and one-quarter back and it makes a nice fit. When the cold air hits the flue and strikes it in the sheet proper, I did not experience the weeping of the flues that I did with the narrow shim.

We are in a bad water district where the flues were not run over a year on account of pitting. We remove them in the course of a year whether they are real bad or not. I used to hear considerable complaint, two or three years ago, from an engine arriving at her destination with thirty flues leaking. I have stopped that complaint.

When the flues are put in, in the shop, just as good as they can be put in, the engine goes out; they blow it out and the flues are about ready to leak, if they do not show signs of leaking, when they get through. When they put the engine into the roundhouse to give it a final touching up I have the flues rolled lightly and calked. I have not had a complaint for at least six or eight months, and we have practically stopped the flue trouble.

We are using the Tyler tube for our iron tube, and we have had several test sets of steel tubes. We have good results; have them in use for twelve months in a bad water district. Where we cannot run an engine over one trip without washing it, you might possibly get two trips, but the engine will foam and it is liable to be burned before it gets back. We use forty-pound copper and we make up the difference in the holes and swedge the flues all standard.

MR. GOODWIN—I haven't any flue problems. The only troubles I have are crown-sheet troubles, but what I want to ask is that the Auditing Committee, which was appointed to go over my books, go into this question of flues as soon as they can get out.

MR. KAVANAUGH—I want to ask Brother Lucas if he did not have a flue failure on his line for six or eight months?

D. A. LUCAS—I have not had a complaint come back to the main shop for six or eight months on account of flues leaking. We turn them out of the shop and they go 400 or 500 miles in the bad water district. Many failures are due to the treatment the engine gets before it goes out.

A MEMBER—You have your flue failures just the same as any of us, but yours all fail at the shop.

D. A. LUCAS—I was talking on shop practices, but I will state that our engines are coming back for overhauling in eight or twelve months with the flues all right.

MR. KAVANAUGH—You are in a good water district.

MR. LUCAS—Not a very good water district where an engine has to be cooled down and washed every trip.

PRESIDENT SMYTHE—It would be well to state the kind of tools, state of the water and size of the engine, and let us be free to talk.

A. N. LUCAS—A great many times, in doing roundhouse work, the flues leak badly and quite often; the boiler maker gets instructions to go after them hard. The harder they go after them the worse the results. They crack the bridges and pull the flue sheets out of shape. Sometimes the boiler maker is not to blame, as he has orders to work them as hard as he can. You cannot work a flue too light; just work it tight in the sheet and do not work the sheet itself.

MR. LEWIS—I went to the Lehigh Valley last January and found conditions similar to what Mr. Hennessey spoke about on the New York Central, and I went into the question of the tools the men were using. I found them all using the roller expander, and they were rolling and rolling and rolling. They kept a record of what engines they had worked on and everything had been rolled.

I reported to my superior officers that the practice would have to stop if they wanted to maintain the life of the flue. I said, "Take the rollers away from the men and give them a Prosser tool and see that they are furnished with the proper beading tools." I have had beading tools sent in that would be just as good as to take a sledge hammer and pound on the flues. The men have been ordered to discontinue using the roller expander in roundhouse work, and the reports coming in for the last month have been very encouraging.

It has been my practice to inquire of the men in charge of the work at the roundhouses how many engine failures they have, and they have not had one in the last two weeks, while before it was a common thing for engines to get just outside of the shop and away from the roundhouse and fall down.

I think the proper tool to be used to maintain the life of the flues is a Prosser tool, one with the shoulder on and one with the shoulder off.

I might say that I have changed the method of applying flues. I have put into practice the same method as Mr. Lucas, with the exception that he does not roll the flues at all. I believe that when we first apply the flues we ought to give them a light rolling after the Prosser has done its work.

MR. HENNESSEY—When using the Prosser expander have you ever experienced any bursting of flues?

Answer: Yes, we have. The flues on which the men had been using a flue roller had been reduced to such a slight thickness that they would hardly stand the Prosser; but with the flues we have been putting in lately we have never had any of them burst with the Prosser tool.

MR. LESTER—The method of applying flues on the Erie is similar to that of Mr. Lucas's. We have taken the rollers away from the roundhouse men entirely, and we use a Prosser expander with the shoulder and another without a shoulder. We have a No. 1 and No. 2 beading tool and we have one a little larger. We work over the flues at every washout, and we do not average five failures a month. We use National tubing about 75 master mechanic's gauge. The beading tools are all kept up to the standard.

MR. DOARNBERGER—I have been looking forward to this meeting for some time and I had two great ambitions. The first was to see these two bodies unite, and the second was to hear something on the flue question. Flue troubles have been confronting the railroad world for some time and it is a matter of deep concern. We are being looked to to get something out of this meeting. We have our own ways of putting in the copper. Some have the edges taken off, some using one copper and some another; some use the roller and some dips and turns over, but that has not stopped flues leaking. Of course, we have water conditions to contend with. It has been often said that in the deep fire-boxes, with the small boilers carrying 150 pounds of steam, that the short flues never cause failures. To-day we are going the length of the flue. In the last twenty years boiler construction has made wonderful progress. Everything has been done to meet the requirements of high pressure, yet we have not taken care of the flues. They are worked on just the same as twenty years ago. We Prossered them lightly and we could not get results out of that; we began beading and they still leaked. I believe that we should endeavor to try to get up something to better the flues the same as the boiler has been benefitted by construction.

PRESIDENT SMYTHE—May I ask you if you think it would be of benefit to enlarge the bridge of the flue?

A MEMBER—The greatest trouble we have has been by the excessive rolling of the flues. If a set of flues leak and the water and gas comes in contact with each other, they crystallize. There is one thing in favor of the wide bridge. It prolongs the life of the flue sheet and makes it more rigid, but yet the flues leak. I am glad to say that we have a little difference in water. Probably we get 20 per cent. more service out of the Eastern division than in the Western. The Eastern water contains vegetable matter, but it is very easily washed off. In the Western we are troubled with limestone.

MR. PLOWMAN—I belong on the Peoria division of the Big Four, and the flue question is one of the greatest we have to meet. We have eighteen or twenty extremely wide fire-boxes, and the greatest trouble is in the flue sheet bulging at the bottom. We put in a set of flues and they run from four to seven or eight months, when the flue sheet will bulge as much as one and five-eighths inches at the bottom. We adopted the plan of leaving out the open space of flues and bracing them with one and one-fourth-inch braces. We have been getting good results from this. I have a blueprint of the way we brace them and would like to have the brothers look at it. We braced two of our engines that way, and one of them has been running over two years and the other about fourteen months. We find that the life of our flues is from seven to eight months longer with our flue sheets braced.

Question: What is the mileage?

Answer: I cannot give you that. I never paid any attention to the mileage. They run different ways out of Urbana and have been in continual service for two years.

T. J. MORRISON—Much has been said about flue setting, but there is as much need of taking care of the flues after they are set in the boiler as there is in the setting of the flue. We take them out and clean the flue holes out—clean out the dirt which accumulates. We drive them in tight and roll the flues lightly after we put them in; then I have them laid over with a hammer, and when the man is laying them over I have them rolled in the front end before I have them expanded in the back end. And then we bead them.

In regard to the engine after it goes out, I have gone out and shut off the blower myself. Whether it is warm weather or cold weather, they will turn on the blower, and the flue being thinner than the sheet, it will contract sooner. There is a great deal in the care that the fireman will give an engine on the road. Some firemen and engineers will get better service out of their flues than others because they keep their fire level. If there was more care taken of the engines at terminals and more of the boilers at washouts, it would be better. We have been able to dispense with one boiler maker on repairs. We blow off the boiler through the pipes, wash with hot water and fill the boiler again with hot water. The flue sheet and fire-box is never cold, and we do not have much trouble with flues or cracked side sheets. I thought at one time that there was nothing like rollers, but we now use a Prosser expander. When a flue is rolled too often it stretches and becomes thin, and you have not enough material to work on to keep it tight. Since we have been using the Prosser we get from eight to nine months out of the lower half; then we take out 100 or 125 and renew them on the bottom.

MR. FLAVIN—I want to ask Mr. Morrison if he rolls the flue after it is Prossered?

Answer: No, sir; before.

MR. FLAVIN—One of the greatest mistakes is to roll a flue after it is Prossered. Twenty years ago, at the International Railway Exhibit, I had charge of the flue demonstration of the C. & A. road. The first flue was rolled and beaded; the next was Prossered and beaded; the next was Prossered and rolled and beaded; the last was Prossered, beaded and then rolled. We found in the case where the flue was Prossered and beaded that the joint on the fire side was perfect, but there was no joint between the edges of the sheet. In the case of the flue that was Prossered and then rolled, we found that the entire labor of Prossering the flue was wasted. I venture to say that many roads Prosser the flue and then roll it. The flue that was rolled and then beaded showed a very pronounced joint on the fire side, but not nearly so pronounced a joint on the water side. The taper end of the flue on the fire side will roll more than on the inside. After that the practice was to roll the flues lightly, then Prosser and then bead. Another objection to the roller is that the copper ferrule is put in because it is fibrous; but I have visited shops where the roller is used to such an extent that the copper ferrule is entirely useless. The roller should never be used hard. Another thing is the rolling that the flue receives after the engine is in service. It doesn't make so much difference whether they are Prossered and beaded, but after the flues are once in service the roller should never be used on them unless it is absolutely necessary. And in a good water district the roller should never be used except in a case where an incompetent man permitted the engine to be blown out.

On many roads it is advisable to remove from time to time fifty to ninety flues in bad water. It is very plainly to be seen that those flue holes become enlarged; in many cases they require two coppers. There should never be a given limit to the length of the flue to be turned over because the flue bead has one more thing to do when it stops a leak, and that is to brace the sheet.

Another thing is narrow bridges. I applied one flue sheet that had less than thirteen-sixteenths bridge. The master mechanic was not pleased with dropping so many flues, but I thought then an engine would be run with fifty or sixty flues plugged. Whenever it is time to plug one flue there must be a great many more. There is no excuse to-day for a plugged flue. If it has burst it should be removed, which is a very simple matter.

I think the flue proposition is one of the most important questions to come up before this convention, and we must not hurry through, because, just like the first Congress of the United States, this meeting will be looked upon as one of vast importance. It is the first real meeting of the Foremen Boiler Makers. Up to this time we have had two different organizations, and now I wish there had been three or four different organizations. We should go into this subject with care and make this a banner convention.

PRESIDENT SMYTHE—Don't you think that they often use the expander the second time to overcome the improper holding of the beading tool?

Answer: They do, but there are are many districts where they could not do that. I remember that twenty-five years ago the second application of the Prosser would mean a split flue; but they have procured better water and I do not believe that this condition exists to-day. There are points where the acid in the water has a tendency to crystallize the fiber of the flue and it becomes like glass.

It seems fabulous to think that a set of flues will last two years, but in those districts they go up against those things hard. We must take care about the copper. Someone said that the copper should be about one-eighth of an inch wider than the sheet. Why should that be so? All it does is to reduce the circulation. I stand for the ferrule being exactly the same thickness as the sheet.

Much damage is done in draining the boiler hot and then filling it. And another thing to be considered is the size of the nozzle. With a self-cleaning front end it is wrong to apply a set of nozzles so small that the entire draft of the fire-box goes in every time the fireman opens the door. We will never solve the flue proposition until we solve that of the nozzle. This is a big subject. We know how long a radial stay will last; we know what to do with them, but the flue means the success or failure of the trip. The flue proposition is responsible for more delays and expense than any other proposition.

PRESIDENT SMYTHE—You have noticed in many cases in beading a flue it would lap a burr on the inside; you would not use a roller expander; would you recommend that in order to get rid of that bead that you use a Prosser expander?

Answer: Use a Prosser expander, if the water is of such a nature that the flue has not begun to crystallize. The lightest hammer made should be recommended for the use of rebeading flues.

The greater the number of flues the greater the bridge should be. Another fact is that the upper row is so close that they crack from the top of the flue hole to the center of the rivet hole. They put a plug in them and there is a stream of water that causes the other flues to leak and they tie them up.

I scarf the sheet down to the knuckle of the flange and apply a one-quarter-inch patch very light, drive and countersink. To cut out the top knuckle of the flue sheet destroys the resistance of the sheet. We should allow a sufficient distance between the upper edge of the flue hole and the knuckle of the flange.

MR. KELLEY—We argue this flue question back and forth. We ought to get at some standard practice. We all have flue troubles and each one seems to have a different method of overcoming them. If three-sixteenths is enough bead for nine or ten men of this association, and if three-quarter-inch copper or five-eighths copper is the amount for a majority of the men of this convention, we should pass upon these questions and take a vote.

I try to keep the flue holes on the top down. I cut the burr off on both sides and use forty-pound copper. If I can increase the bridge to seven-eighths of an inch, I do so. I lay out all my flue holes to increase the water space. I leave out five flues in small engines and nine in large engines. The majority should rule on these things. The flue is swedged down to about one inch. We expand good and hard with an air hammer. We expand two rows straight across. I do not believe in starting at the bottom of the flue sheet with any kind of a hammer. If you do not stay the flue sheet you will have trouble.

I think these things should be taken up by a committee; appoint men who are in the harness and not afraid to find out what is being done.

We use three-sixteenths inch for bead and have a standard beading tool. I think this association should get up a Master Boiler Makers' gauge. We should be broad in our views and not split hairs on these subjects. I have no use for the roller at all except in the oblong holes. We do not allow anybody to use a roller. A Prosser expander in the roundhouse is all right, and I believe it is the only method. I believe there is a tool coming on the market to-day that is going to help out. It will not work the sheet or crowd it upward.

We may exercise all kinds of care in the shop, but when the flues leak on the road the boiler maker is to blame for it all; but the man with the injector and the fireman with the shovel can stop the perfect circulation of water. They may be tied up with a heavy mud-ring and there is a dead line of water. I think we ought to have on all our boiler checks a nozzle that turns the water up.

On one of the fastest runs in our territory we had an engineer who would bring an engine back leaking every trip, and when another man took the engine it stopped.

We should recommend purified water, no matter how it is obtained. I claim that bad water, together with the fact that the engineer will work an injector at the wrong time, and poor firing, has as much to do with flues leaking as anything. It is our fault just the same. We should get after these matters, point out the mistakes, and when we get on record there will certainly be some action taken.

MR. STEWART—Something should be done on the inside of the boiler. We are using a water pocket. It puts the water over the top of the flue. We have been using that since last November, making a test, and have received some benefit, but it is most too soon to recommend it.

D. A. LUCAS—During the past two years we have been using a nozzle on the inside of the check. A great amount of damage is done by blowing the cold air on the flues. I have profited by the remarks here, but I could never use the narrow copper. I have turned engines out of the shop with a narrow copper when they first came out—one-half inch copper for a half-inch sheet. They had to go over two division points and died three times from leaking. The engines had just as good bead and expanded just as good as a flue could be. They were rolled and calked and we got 7,000 miles out of them.

One day a special came along to take all the superintendents of motive power and master mechanics on the division to Denver. They asked me what engine I was going to give them, and I said, "One that has made 40,000 miles and never failed." I put on the engine, and after going eighty miles it died. They wanted to know what was the matter with it and I said that the trouble was inside, and as soon as I pulled the flue I could tell what the trouble was. The engine had a five-eighths shim or copper ferrule applied in the sheet without the edges of the hole being filleted. It was just as it came from the drill press, and in expanding the flue with the Prosser expander it cut the copper ferrule off on the inside flush with the sheet, spoiling the joint made on the copper with the shoulder of the expander. It was impossible to keep the engine from leaking. The flues were reset, filleting the holes, using the same width of copper, and the flues worked with the same process, Prosser expander and beader, as the work previous, and the engine made 96,000 miles without any delays on account of flues leaking.

PRESIDENT SMYTHE—It is time to quit, but it seems to me that there should be some recommendation made. We should recommend something and go home and try it. While it might be recommended, it does not follow that the method is the best. We have a year in which to try it and come back and report.

MR. FLAVIN—The subject has not been half covered, and I move the appointment of a committee to make a full report at the next convention. Seconded by many voices and carried.

Thereupon President Hempel appointed the following committee on flues: E. J. Hennessey, Frank Gray, D. A. Lucas, T. S. Morrison, F. J. Kelley, B. F. Flavin and T. W. Lowe.

An adjournment was then had until 2 P. M.

## THURSDAY AFTERNOON SESSION.

President Hempel called the meeting to order at 2 P. M. and announced that Mr. Wagstaff, as chairman of the Executive Committee, was ready to report.

### REPORT OF EXECUTIVE COMMITTEE.

MR. WAGSTAFF—You are no doubt aware that this is a committee of ten members of the two associations, the Executive Board. They have done me the honor of appointing me temporary chairman. I only represent the body as chairman for this occasion, on By-Laws and Constitution. We met as early as possible yesterday morning and worked until quite late last night; went to work again this morning at 8 o'clock and attended strictly to business. It has brought us much closer together. We had such a good time that we did not feel as though we wanted to separate in that committee room without shaking hands with one another. We never had an argument. It was just a good, common-sense talk, and I do not think I would be justified in reading these rules without letting you know that there was perfect harmony, and we feel that the tie is stronger from the fact that we had the privilege of being together for a day and a half.

You are aware that the time was limited in which to take up so many subjects one after another. It was pretty hard for the committee to make up their minds, and it is quite possible that there may be some articles that were not thought of, but I think we have covered it sufficiently until we can have time to think it over and see whether it needs any revision or not.

# CONSTITUTION AND BY-LAWS.

## ARTICLE I.

### NAME.

"International Master Boiler Makers' Association."

## ARTICLE II.

The object of this Association shall be the mutual improvement of its members by exchanging ideas by means of meeting, and the reading and discussing of papers, and the general exchange of views, so that we may all profit by the experience of others more proficient in our craft.

## ARTICLE III.

Section 1. The officers of this Association shall consist of a President, First, Second, Third, Fourth and Fifth Vice-President, a Secretary and a Treasurer.

Sec. 2. The office of President, First, Second, Third, Fourth and Fifth Vice-Presidents, Secretary and Treasurer shall be elective at the annual convention.

Sec. 3. The election of officers of the Association shall be by ballot. They shall be elected separately, and a majority of all votes cast shall be necessary for a choice.

Sec. 4. Only active members in good standing shall be allowed to ballot for officers.

## ARTICLE IV.

### EXECUTIVE BOARD.

Section 1. There shall be an Executive Board, to consist of five (5) members.

Sec. 2. The Chairman of the Executive Board shall be appointed by the President of the Association.

SEC. 3. The Chairman of the Executive Board shall appoint the remaining members of the Board.

## ARTICLE V.

### DUTIES OF PRESIDENT.

It shall be the duty of the President to preside at all meetings of the Association; to appoint all committees; decide all points of order; receive and submit all motions duly made by the members; put to vote all motions regularly made, announcing the results, and voting only in case of a tie; and he shall exercise general supervision over the affairs of the Association.

## ARTICLE VI.

### DUTIES OF VICE-PRESIDENT.

It shall be the duties of the Vice-Presidents to assist the President in such duties as he may require of them; and in the absence of the President they shall preside at the meetings of the Association and perform all duties of the office in their regular order.

## ARTICLE VII.

### DUTIES OF THE SECRETARY.

It shall be the duties of the Secretary to keep a correct record of the proceedings of all meetings of the Association; to attend to all correspondence; to keep a record of the membership; to receive all moneys, and turn all moneys received over to the Treasurer; he shall also take charge of all books, papers and other property, and perform such other duties pertaining to his office as may be required of him by the Association.

## ARTICLE VIII.

### DUTIES OF THE TREASURER.

It shall be the duties of the Treasurer to receive and receipt for and safely deposit in bank all moneys belonging to the Association; he shall keep a correct record of all moneys received, and submit to the President, Secretary and Chairman of the Executive Board a quarterly statement of the condition of the treasury, showing the balance on hand at the previous report, the amount received and disbursed since the last report, together with the balance on hand; and shall pay out no moneys except on warrant drawn by the Secretary and signed by the President.

## ARTICLE IX.

### BOARD OF OFFICERS.

The Secretary and Treasurer shall be secured by a security company, the expenses of which shall be borne by the Association.

## ARTICLE X.

### DUTIES OF EXECUTIVE BOARD.

SECTION 1. The Executive Board shall exercise a general supervision over the interests of the Association; recommend the amount of the annual assessments, to call, to prepare for and to conduct annual conventions; to make all necessary purchases, expenditures and contracts required; to conduct the current business of the Association.

They shall have no power to make the Association liable for any debts to an amount beyond that which at the time of contracting the same shall be in the Treasurer's hands in cash and not subject to prior liabilities; all expenditures shall only be made by appropriations acted upon by the Executive Board.

Sec. 2. The Executive Board shall make a report of the proceedings of each of its meetings, such report to be made accessible to all members of the Association. It shall have the proceedings of the regular meetings of the Association published, subject to the instructions from the latter. It shall have the power to withhold from the published proceedings, papers and reports containing old matter readily found elsewhere, those especially meant to advocate personal interests, those carelessly prepared or controverting well-established facts, and those purely speculative or foreign to the purpose of the Association, or any which in the opinion of the Board are unworthy of publication.

Sec. 3. Two-thirds of the members of the Executive Board may call special meetings of the Association, to be held not less than thirty days after notice thereof has been mailed to each member of the Asosciation.

Sec. 4. The Executive Board shall have the power to change the place of the regular meetings as they shall deem to the best interests of the Association.

## ARTICLE XI.

### MEMBERSHIP.

Section 1. *Active Members* shall consist of Master Boiler Makers, Assistant Foremen and General Boiler Inspectors, and filling such position at time of application.

Applicants for active membership shall submit their request in writing, give name in full and name and address of the road or company by which they are employed.

Applications for active membership must bear the signatures of at least two members of the Association in good standing.

Sec. 2. *Associate Members* shall consist of men who have served as Master Boiler Makers, or others whose experience shall be valuable to the Association. Such members shall not have the privilege of voting.

Sec. 3. *Honorary Members* shall consist of those who have served as active members and on account of old age or ill health have been obliged to retire from active service; such members shall not be required to pay dues.

Sec. 4. Applications for membership shall be acted upon only at the annual convention following date of application.

## ARTICLE XII.

### FEES AND DUES.

Section 1. The initiation fee in this Association shall be Three Dollars ($3).

Sec. 2. The annual dues shall be Two Dollars ($2) per year, payable April 1st.

Sec. 3. The initiation fee of $3 shall accompany each application for membership. Dues payable as per Sec. 2 of this Article.

## ARTICLE XIII.

### MEMBERS IN ARREARS.

Members in arrears for dues may hold seats in the convention, but such members shall not be entitled to vote or take part in any discussion, nor in the transaction of any business brought before the Association, until such arrears are paid; and after the expiration of two (2) years the Secretary will notify such members that they will be suspended for non-payment of dues.

## ARTICLE XIV.

### MEETINGS.

Section 1. The regular annual convention of this Association shall be held in the month of May. The dates and hour of assembly to be decided upon by the Executive Board, and notice thereof shall be mailed to each member at least thirty (30) days in advance.

Sec. 2. *Quorum.* Nine members at any meeting shall constitute a quorum for the transaction of business, but any less number shall have power to adjourn to any time and place they may deem proper.

Sec. 3. The next place of meeting shall be determined by ballot, a majority vote of all members present being necessary to choice.

## ARTICLE XV.

### AMENDMENTS.

No article or clause to the foregoing Constitution shall be altered, amended or repealed except at an annual meeting, and then only by a two-third (2/3) vote of the members present.

## ARTICLE XVI.

### ORDER OF BUSINESS.

1. Roll-call.
2. Report of Officers.
3. Report of Committees.
4. Unfinished Business.
5. New Business.
6. Election of Officers.
7. Appointment of Committees.
8. Adjournment.

(Signed) George Wagstaff, *Chairman,*
John McKeowen,
William M. Wilson,
Chas. P. Patrick,
P. J. Conrath,
E. S. Fitzsimmons,
T. W. Lowe,
W. H. Shaw,
A. E. Brown,
G. W. Bennett,
*Executive Board.*

It was moved by Mr. Flavin that the report of the committee be adopted as read and the committee be discharged. Carried.

It was moved by President Smythe that a rising vote of thanks be tendered the committee for their faithful services, which was seconded by many voices and carried unanimously.

PRESIDENT HEMPEL—You have an entire year to look over the resolutions and bring up any amendment at the next meeting.

MR. SLATE—In February or March the Champion Rivet Company offered three prizes to the ones who would submit the best article on the subject of "Driving Steel Rivets. The first prize was $50, the second $35 and the third $25. The papers were closed May 1st and all sent in under *nom de plumes,* the judges not knowing who had written them. I have the pleasure of announcing that the first prize has been awarded to James Cromby, of Hamilton, Ont.; the second to James T. Goodwin, of the American Locomotive Works at Richmond, Va., and the third to Thomas C. Best, of the Jos. T. Ryerson Co., Chicago.

These papers will all be published in a future issue of the *Boiler Maker.*

PRESIDENT SMYTHE—If I am not out of order I would propose three cheers for the winners.

Three lusty cheers were given.

The Secretary read the following communication:

We, the members of the Ladies' Auxiliary, wish to express our grateful appreciation of favors shown us during our stay in Cleveland. During the past year the recollections of our Milwaukee trip have lingered with us, and we are quite sure those of Cleveland will linger not only for one year but for many years.

Realizing as we do that these conventions would not mean much to us were it not for the splendid entertainment furnished by this association, we take this method of returning our thanks for all courtesies extended in the hope that they have been equally beneficial to both organizations.

Respectfully submitted,
Mrs. W. H. Laughridge,
Mrs. J. H. Smythe,
Mrs. A. N. Lucas.

It was moved that the communication be received and placed on file. Seconded and carried.

PRESIDENT SMYTHE—I move that on the adjournment of this meeting the treasurers of the two organizations turn over to the treasurer elect all funds remaining in their hands.

Seconded and carried unanimously.

## REPORT OF SECRETARY GOODWIN.

*Mr. President and members of the International Railway Master Boiler Makers' Association:*

GENTLEMEN:—It affords your Secretary-Treasurer pleasure to report the past year, which has been a very busy one, owing to the class of work due to inaugurating the campaign of the coming convention, in which interest has been largely manifested by all of the members, much encouragement having come from all quarters. Our Association has not grown as large as we would like to have seen it; however, we can say it is very much improved in many ways, and by attached reports you can see the increased receipts and disbursements since our last session.

We have had the sad misfortune to lose one of our members by death, namely, Mr. W. S. Hansom, of Richmond, Va.

With no withdrawals and twenty new members your Secretary found 158 enrolled members at our last session in good standing, making a total of 178 members in good standing at this date.

We also find a good many who have signified their intention of associating themselves with us at this session, and we can congratulate our Association for the work that has been done during the past year.

The Secretary desires to express the thanks of the Association to the supply people who so kindly gave us advertisements for the proceedings, and can say that many more were ready to assist in that manner if we had only space to grant them.

Respectfully submitted,
J. T. GOODWIN,
Secretary and Treasurer.

## REPORT OF AUDITING COMMITTEE.

Your committee beg leave to report that we have gone over, examined and audited the books of Secretary and Treasurer Goodwin, and that the same have been handled in a business-like manner.

Receipts and disbursements as follows:

| | |
|---|---|
| Receipts | $770.03 |
| Disbursements | 631.75 |
| Balance | $138.28 |

Respectfully submitted,
E. P. KAVANAUGH,
THOMAS LEWIS,
A. N. LUCAS.

It was moved that the report of the Auditing Committee be accepted and the committee discharged. Carried.

PRESIDENT SMYTHE—Our Secretary failed to report the number of members that we bring you, and also the number received during the year.

SECRETARY CLARK—We have 14 associate members, 319 active members. In good standing 198, and in poor standing 124. In the past year we have taken in fifty-four new members, of whom twelve are yet
The following new members were received into the Association:
to pay dues.

| Name. | Location. |
|---|---|
| Willard M. Hastings | N. & W. R. R., Portsmouth, Ohio. |
| Mathew Billington | B. R. & P. R. R., Lincoln Park, N. Y. |
| Chas. J. Kline | N. Y. C. R. R., Albany, N. Y. |
| J. T. Martin | Am. Loco. Co., Richmond, Va. |
| Fred S. Graefe | A. T. & S. F. R. R., Albuquerque, New Mex. |
| G. S. Ryan | B. R. & P. R. R., DuBoise, Pa. |
| Chas. Stewart | A. T. & S. F. R. R., Winslow, Ara. |
| T. S. Neisler | Am. Loco. Co., Richmond, Va. |
| J. B. Tynan | W. & L. E. R. R., Norwalk, Ohio. |
| W. Seigfried | L. V. R. R., Sayre, Pa. |
| Thos. O'Neil | L. V. R. R., Sayre, Pa. |
| G. W. Beauer | T. R. & C. R. R., Toledo, Ohio. |
| T. L. Mallan | P. R. R., Trenton, Pa. |
| R. P. Cummins | Big Four R. R., Mt. Carmel, Ill. |
| C. R. Bennett | P. R. R., Logansport, Ind. |
| T.. Burdett | C. & N. W. R. R., Fond du Lac, Wis. |
| A. A. Murphy | St. L. & S. F. R. R., Cape Girardau, Mo. |
| Jas. T. Mitchell | Col. Sou., 1310 Linden Ave., Trinidad, Col. |
| M. T. Harron | Philadelphia, Pa. |
| G. N. Reily | c/o National Tube Co., Pittsburg, Pa. |
| J. Stephens | Canton, Ohio. |

PRESIDENT HEMPEL—There is one thing I think we have overlooked, and inasmuch as none of the members have brought it up, I wish to call your attention to the supply men who have entertained us so generously. I think it would be fitting that we offer them a resolution thanking them for our entertainment.

It was moved that a committee be appointed to draft suitable resolutions thanking the supply men, also the management of the Hollenden Hotel, for courtesies extended. Carried.

MR. WILSON—Is there no standing committee on resolutions on the death of any of our members?

MR. LAUGHRIDGE—I believe we have a standing committee, Mr. Hennessey and Mr. Goodwin, who were to confer with the locomotive builders in regard to furnishing prints and templates.

MR. GOODWIN—I think that matter should come up before the new organization.

PRESIDENT HEMPEL—We have forgotten one thing: We certainly cannot come together next year without a place of meeting.

Thereupon the following cities were placed in nomination for the next convention city: Detroit, St. Louis and Indianapolis.

Detroit receiving the majority of the votes, it was moved that that city be the unanimous choice of the convention for the next meeting place. Carried.

MR. PATRICK—I notice here a bill providing for State boiler inspection. I have not devoted much attention to it, but as copies have been scattered around and talked of, I would like to know what we should do with it. As far as I have read it is very good.

It was moved by Mr. Flavin that it be referred to a special committee to report at the next meeting. Carried.

It was moved by Mr. Fitzsimmons that all members not in good standing should not be entitled to vote. Carried.

## Election of Officers.

MR. WILSON—I would like to place in nomination the name of one who has done a great deal for this organization, the first one to come forward and entertain the idea of consolidating these two bodies. He would make a good President and I hope you will elect J. T. Goodwin, of Richmond.

The nomination of Mr. Goodwin was seconded by many voices.

MR. LETTRI—I would like to place in nomination the name of E. J. Hennessey. He has been a hard worker for the welfare of the association and I would like to see him President.

Mr. Hennessey's nomination was seconded.

MR. LUCAS—I would like to put in nomination a man who has been an untiring worker and one who has the ability, the strength and the time to give us everything we want. One whom we all know and look up to, Mr. George Wagstaff.

MR. BENNETT—I am glad to second the nomination of Mr. Wagstaff. He has worked earnestly to bring these two bodies together. His business takes him all over the country, and every place he goes he has a good word for the Association.

It was moved by Mr. Laughridge that the nominations close.

MR. HENNESSEY—Before that motion is put I would like to say a few words. It gives me great pleasure to have my name brought before this convention as a candidate for the presidency of this great organization. According to the rules of the old organization I perhaps am entitled to the office, but since the two bodies have come together it falls upon this convention to elect some man with greater ability, perhaps, and more time to devote to Association affairs, for the next year or two, than I would have. Tied up as I am, I do not think that I could give the work the time that it would require.

Therefore, as our friend Mr. Bennett has said, Mr. Wagstaff has done a great deal in the past year to get these two organizations working together harmoniously, and I would decline in favor of Mr. Wagstaff, thanking my friends for the nomination.

The motion to close the nominations was seconded and carried.

The ballot resulted in favor of Mr. Wagstaff, and it was moved by Mr. Goodwin that the election of Mr. Wagstaff be made unanimous, which was duly carried.

MR. WAGSTAFF—I am more sorry for you than I am for myself. This may not appear so much of a joke, a year hence, as it does now. During the past year I have been busily engaged in working for this Association, and regardless of the honor that has been conferred upon me this afternoon, the culmination of the work of bringing so many of us together would be sufficient to make me delighted. I assure you that I can only do one man's work, and it will be my great pleasure during the coming year to transact the business in as good a manner as is possible for me. The organization is not what we would like to see it; it is not what we expected it to be, but we must remember that we are young and have a long time in which to grow. Let us hope that during the coming year its advancement will be such that it will not only reflect credit on your President, but upon all the officers who may be elected and the members.

I thank you very heartily for the unanimous election, and I assure you that I will fill the office to the best of my ability. (Applause.)

For First Vice-President, E. S. Fitzsimmons, E. W. Rogers, Mr. Patrick, E. J. Hennessey and E. P. Kavanaugh were placed in nomination. Messrs. Patrick, Kavanaugh and Hennessey declined the nomination in favor of Mr. Fitzsimmons and the ballot resulted in his favor.

It was moved by Mr. Rogers that Mr. Fitzsimmons be declared the unanimous choice of the convention for First Vice-President, which was accordingly done.

MR. FITZSIMMONS—I may be a little timid under the circumstances, but I assure you it is an honor to be elected your First Vice-President. I believe you all know, without my saying so, that I have been greatly interested in the organization from its incipiency. It will be my earnest endeavor to assist your President and the other officers in making this organization one of the greatest in the country. I sincerely hope that each and every one will do the same. (Applause.)

The name of E. J. Hennessey was placed in nomination for Second Vice-President and seconded by many.

It was moved by Mr. Laughridge that the nominations close and that the Secretary be instructed to cast the entire vote of the convention for Mr. Hennessey. Seconded and unanimously carried.

Thereupon Mr. Hennessey was declared the unanimous choice of the convention for Second Vice-President.

MR. HENNESSEY—I am not much of a talker except in the boiler shop where there is lots of noise, but when I say anything I generally mean what I say; but in a convention of this kind you will have to excuse all mistakes. I have been a member of the Association since it was founded. I have been appointed on committees and I have performed my duties to the best of my ability, and as long as I remain a member of this organization I shall continue to work for its good. I shall try to fill the position you have given me as best I can. I thank you for the unanimous vote of this body and hope that Hennessey will never do anything disagreeable to the members of this Association. (Applause.)

MR. GOODWIN—One of the most pleasing privileges that I ever had in my life is to stand up before this International Master Boiler Makers' convention. When I think back over the pleasant associations, the untiring interest and devotion which has characterized the members of the craft that we represent, I think with a great deal of pleasure of one who is well known in both organizations, one who is an honor to the Association and has filled the position of President with honor. I would nominate for Third Vice-President William H. Wilson, of Chicago.

The nomination of Mr. Wilson was seconded by many.

It was moved by Mr. Bennett that the nominations close and that the Secretary cast the entire ballot of the Association for Mr. Wilson, which was accordingly done, and Mr. Wilson was declared the unanimous choice of the convention for Third Vice-President. Carried.

MR. WILSON—I assure you that I deeply appreciate the compliment paid me. I only hope I am worthy of the good things that have been said about me. I want to thank you all for the confidence you have placed in me by giving me the unanimous vote of the Association for Third Vice-President. It gives me a great deal of pleasure to have the unanimous election to this office, because my wife sits over there to see me get this position. I feel that where our wives are concerned we can always go a great deal more, and I only hope now that I have been married, I will be able to fill the position of Third Vice-President better than I have ever filled any position I have held.

The adoption of the Constitution and By-Laws by this Association in such a magnanimous spirit, and the good-will which has prevailed throughout all the meetings, executive and otherwise, and the consummation of this consolidation which we have so long looked forward to—the bringing together of all these men representing the boiler craft throughout this country into one common interest, working for the common good of the Association as well as future generations—is very gratifying indeed.

While I saw things very clearly two or three years ago, just as it has been to-day, it would have been very hard to impress that view upon others. It gives me joy to the bottom of my heart. We are now the International Master Boiler Makers' Association, and I esteem it a pleasure indeed to act as one of your officers. I shall endeavor to perform the duties assigned to me to the best of my ability, and when I gaze upon your faces at the next convention it will be with the impress right here, "Duty well done." (Applause.)

The name of E. W. Rogers was placed in nomination for Fourth Vice-President and seconded.

It was moved that the nominations close and that the Secretary cast the ballot of the organization for Mr. Rogers, which was duly seconded and carried unanimously and the President declared Mr. Rogers duly elected Fourth Vice-President.

Peter F. Flavin was placed in nomination for Fifth Vice-President.

It was moved by Mr. Kavanaugh that the nominations close and that Mr. Flavin's election be unanimous, which was seconded and carried and Mr. Flavin was declared the unanimous choice of the convention for Fifth Vice-President.

MR. FLAVIN—Nothing could be given to me that I would appreciate any higher than to be an officer of the International Master Boiler Makers' Association. I can sincerely state that there is nothing as close to my heart as the Association. Some years ago we could not have met in this hotel and we did not have the standing that we have to-day. It is a comfort to any boiler maker when he has worked his way up from the rivet gang. Some do not think we are boiler makers because the trade has advanced. It has advanced educationally, and I only regret that there were not more organizations, because organization and application are the basic principles of the success of everything.

While the master mechanics may meet all over the country, I will put the boiler makers against any of them. To be a good boiler maker means not only the work in the shop in the day time, but it means work at night, when the candle is being burned at both ends.

There is one thing I hope this convention will do before it closes, and that is to decide on an official organ, and every article published in that paper passed on by a practical boiler maker; then all papers read before this convention and adopted will be read by our master mechanics, because what we know they will have to learn. The business of master boiler maker has advanced so that to-day the man who lays out a sheet lays out something that when it is done cannot be undone. The blacksmith may stretch his iron or upset it, but when once the wrong mark is placed on a boiler sheet it is a dead loss to the purchaser. To insure a factor of safety the boiler makers stand at the head.

I am glad I was elected a Vice-President. I will do everything I can to further the interests of this Association.

The name of J. T. Goodwin was placed in nomination for Secretary and the nomination duly seconded.

MR. WAGSTAFF—I wish to place in nomination Harry D. Vought. No man holding the position, the same position as all our members, has the necessary time to devote to this large Association. You should not forget that we are a double-header. Mr. Vought is a man who makes much of his living by being Secretary. He has been the successful Secretary of the New York Railroad Club, which has a very large membership, for several years. He is Secretary of the Central Railway Club, which meets in Buffalo, and from a very small membership it is now one of the most progressive railway clubs in the country. He can give his whole time to this Association if it requires it; and to enable me to bring his name before the convention it was necessary for me to find out what terms Mr. Vought would accept. If we so desire he will serve this Association for 75 cents per member. If we choose to allow him to handle the Proceedings he will give each member a copy free, providing you allow him to get the advertising necessary to make the Proceedings a success. And if it is the wish of this Association to have the Proceedings sent broadcast, which I think ought to be done, he is willing to present every member of this organization with a copy of the Proceedings and 25 per cent. of the net profits shall be returned to the Association and placed in its treasury.

I ought to say that this offer is not from Mr. Vought's solicitation. Those in the room who know Mr. Vought know him to be an active man, and that he is well thought of. He is making a good living and don't have to come begging for any position; but believing that we are stepping into a larger field where we ought to be on a par with the larger associations in the country, and believing it is necessary, above all things, to have a good, competent Secretary who can meet the requirements without sacrificing the position which he holds, I take pleasure in nominating Mr. Vought.

MR. GOODWIN—It looks to me as though it would be the proper thing to do. I could not handle the secretaryship; I haven't the time; and while I do not suppose the convention wants me, I would ask the gentleman who nominated me to please withdraw my name.

It was moved by Mr. Laughridge that the nominations close and that the Secretary be instructed to cast the ballot of the organization for Mr. Vought as Secretary, which was accordingly done and the President announced the election of Mr. Vought.

MR. VOUGHT—For this expression of your confidence and of your endorsement of what has been said by the gentleman who so kindly suggested my candidacy, permit me to say that while it is very gratifying and flattering, this is not the time for promises. Promises are easily made and much more easily broken. Please accept assurances that the best of my experience, time, ability and effort will be given in the performance of the important duties of Secretary, with the hope that one year hence, if we live and are allowed to meet each other again, you may have no occasion for the slightest regret. Permit me to say, also, that if every member of this Association does his whole duty, personally and as an individual member of the organization, the brightest prospects anticipated will be fully realized. To this permit me to add that being on the outside during this convention, with ample opportunity to study you as individuals and collectively, and to study your work and the way you do business, it has been a matter of pleasure to note how closely and constantly you have devoted yourselves to the affairs that brought you together, leaving the strong social features, that beckoned you elsewhere, for secondary consideration. Maintain that practice and policy and your future success is assured. (Applause.)

MR. CONRATH—I have the pleasure of bringing before you the name of a man for Treasurer who has been tried and found true; one who possesses all the qualifications necessary for the office, a man who has worked untiringly for the best interests of this Association at all times. He has not had the privilege of being here to-day on account of the large amount of work and the labor troubles which have detained him. That man is Frank Gray, the present encumbent.

MR. HENNESSEY—We have another man who has been associated with us for the past few years and who has done his duty faithfully, Mr. Bennett.

MR. BENNETT—I would decline the nomination in favor of Mr. Gray, at the same time thanking my friends for the compliment.

It was moved that the nominations close and that the Secretary be instructed to cast the ballot of the Association for Mr. Gray, which was accordingly done, and Mr. Gray was duly declared the unanimous choice of the Association for Treasurer.

MR. JEFFERY—In the old Master Steam Boiler Makers' Association we had a sort of a certificate for the members in good standing. Would it not be well for us to adopt some such a sort of a certificate?

MR. WILSON—I think it is Mr. Jeffery's idea that the kettle be left on the certificate.

MR. FLAVIN—I think we should have an official button made.

It was moved that the question of a suitable button, to be worn by members of the Association, be referred to the Executive Committee, to be appointed with full power to act. Seconded and carried.

PRESIDENT HEMPEL—I appreciate very highly the co-operation you have given me, and I thank you very kindly for your attention.

PRESIDENT SMYTHE—I feel like repeating the remarks of my coworker. I wish to thank the members for their hearty co-operation and assure you that I can retire feeling that I have done my best. We are now launched as one grand Association. My wife has been telling me that I have a hump on my back, but now that I belong to a new Association I am going to straighten up. Your President cannot make the organization a success, neither can your Secretary; they must have your support. Let us pledge ourselves to do everything in our power to bring this Association up where its influence will be felt.

MR. HENNESSEY—Before we adjourn, would it not be well to present subjects for consideration next year?

PRESIDENT HEMPEL—It seems to me that the best way to handle that is through the President, who can appoint his committees upon the various subjects and notify them.

MR. DOARNBERGER—I believe it would be a good idea for anyone who has a good topic for consideration to send it in.

Thereupon the convention adjourned, to meet in Detroit in 1908.

# MEMBERSHIP LIST.

## ACTIVE MEMBERS.

| | |
|---|---|
| Adams, A. E | A. C. L., High Springs, Fla. |
| Aires, E. E | C. H. & D. R. R., Lima, O. |
| Alaman, Harry | Vandalia, Terre Haute, Ind. |
| Atkins, W. P | C. &O. R. R., Huntington, W. Va. |
| Aldecorn, William | N. Y. O. & W. R. R., Norwich, N. Y. |
| Atkinson, Frank | American Locomotive Works, Paterson, N. J. |
| Anderson, Robert V | American Locomotive Works, Paterson, N. J. |
| Arkenburg, Frank | Solvay Process Company, Syracuse, N. Y. |
| Aschroft, Joseph | Canadian Pacific Railroad, Nelson, B. C. |
| Backes, M | B. & O. R. R., Newark, O. |
| Batchman, F. A | L. S. & M. R. R., Elkhart, Ind. |
| Bennett, G. W | N. Y. C. & H. R. R. R., West Albany, N. Y. |
| Borneman, L | M. K. & T. R. R., Denison, Tex. |
| Brandt, John A | N. Y. O. & W. R. R., Middletown, N. Y. |
| Bruce, James | Frisco R. R., Kansas City, Mo. |
| Brown, A. E | L. & N. R. R., Louisville, Ky. |
| Billington, Mathew | B. R. & P. R. R., Lincoln Park, N. Y. |
| Beauer, G. W | T. R. & C. R. R., Toledo, O. |
| Bennett, C. R | P. R. R., Logansport, Ind. |
| Burdett, T | C. & N. W. R. R., Found Delac, Wis. |
| Bradshaw, Frank | Talles, N. De M., Santiago, City of Mexico, D. F. |
| Brewer, James | Tennessee Central Railroad, Nashville, Tenn. |
| Backus, Peter Z | Samuel Smith & Sons, Paterson, N. J. |
| Beard, Charles | G. & Q. Railway, Durand, Ecuador, S. A. |
| Blume, Fred W | Power Min. & Mach. Co., Memphis, Tenn. |
| Boyce, John J | Illinois Central Railroad, Chicago, Ill. |
| Bell, James L | New Orleans, La. |
| Beland, Arthur J | Chicago Junction, Chicago, Ill. |
| Berry, Walter A | Morris Sherman Manufacturing Company, Chattanooga, Tenn. |
| Bondy, James H | Boston & Mont. Con. C. Smelt Company, Great Falls, Mont. |
| Border, Joseph F | Lebanon Boiler Works, Lebanon, Pa. |
| Ball, George | American Locomotive Works, Scranton, Pa. |
| Beck, John F | G. R. & I. R. R., Grand Rapids, Mich. |
| Beatty, James | Marine Boiler Manufacturing Company, Toledo, Ohio |
| Bice, Leonidas G. | Sherman Manufacturing Company, Chattanooga, Tenn. |
| Buxton, Joseph P | Calgary, Alberta, Canada. |
| Bailey, John A | Illinois Central Railroad, Memphis, Tenn. |
| Bowhay, Egbert | Union Ice Company, Los Angeles, Cal. |
| Bauman, C. J | N. Y., N. H. & H. R. R., New Haven, Conn. |
| Brown, Robert | Canadian Pacific Railroad, Winnipeg, Man. |
| Cook, James E | B. & L. E. R. R., Greenville, Pa. |
| Cushing, J. R | Big Four, Bellefontaine, O. |
| Conrath, P. J | M. P. R. R., St. Louis, Mo. |
| Chapman, E. R | U. P. R. R., Cheyenne, Wyo. |
| Cummins, R. P | Big Four, Mt. Carmel, Ill. |
| Coughlin, Daniel | N. Y., N. H. & H. R. R., New Haven, Conn. |
| Clark, George M | Chicago, Ill. |
| Connolly, John E | Erie Railroad, Stroudsburg, Pa. |

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|---|---|
| Crawford, William | El Paso Foundry & Machine Company, El Paso, Texas |
| Crombie, James | Hamilton, Ont., Canada. |
| Cook, H. F | Trav. Ins. Company, Cleveland, O. |
| Cour, William | O. M. R. R., Mobile, Ala. |
| Campbell, W. K | Campbell Iron Works, East Cambridge, Mass. |
| Clark, R. W | N. Y. C. & St. L. R. R., Nashville, Tenn. |
| Carr, Lee B | Erie Railroad, Meadville, Pa. |
| Clemro, William T | United Verde Copper Company, Jerome, Ariz. |
| Callinan, W. F | J. I. Case Manufacturing Company, Racine, Wis. |
| Clark, Charles B | Allis-Chalmers Company, Scranton, Pa. |
| Crosier, Charles W | Oswego B. & E. Company, Oswego, N. Y. |
| Casey, John F | A. C. M. Company, Anaconda, Mont. |
| Cook, John | Springfield, Ill. |
| | |
| Davis, R. H | Southern Pacific Railroad, Ogden, Ut. |
| Dittrick, A. C | Soo Line, Minneapolis, Minn. |
| Doarnberger, J. A | Norfolk & Western Railroad, Roanoke, Va. |
| Dunkelberger, Daniel I | P. & R. R., Reading, Pa. |
| Doughlas, Arthur B | Farrar & Treffts, Buffalo, N. Y. |
| Dixon, E. A | Davenport Locomotive Works, Davenport, Ia. |
| Dussel, Alex | J. D. Tonnell Iron Works, New Orleans, La. |
| Donahue, James | Monarch Tool Company, Indianapolis, Ind. |
| Daley, Frank | Lidgewood Manufacturing Company, Brooklyn, N. Y. |
| Downey, Michael | Vulcan I. Works, Winnipeg, Man. |
| Denham, J. C | Seaboard Air Line, Americus, Ga. |
| Ehret, Henry | Frisco Railway, Cape Girardeau, Mo. |
| Elvinn, H. E | C. & E. R. R., Huntington, Ind. |
| Evans, W. L | East Jersey Pipe Company, Paterson, N. J. |
| Evans, I. W | C. R. I. & P. R. R., Shawnee, Okla. |
| Ehrmeintraut, J. J | C. & A. Shops, Bloomington, Ill. |
| Elkins, C. E | Missouri Pacific Railroad, Little Rock, Ark. |
| Eck, Peter | Illinois Central Railroad, Mattoon, Ill. |
| Filcher, J. H | Big Four, Indianapolis, Ind. |
| | |
| Frey, Adolph G | B. R. & P. R. R., Salamanca, N. Y. |
| Fleming, M. L | B. & O. R. R., Baltimore, Md. |
| Flavin, Peter F | Standard Railway Company, St. Louis, Mo. |
| Fahey, James H | J. I. Case Manufacturing Company, Racine, Wis. |
| Fletcher, James J | Canadian Foundry & Machine Company, Toronto, Ont., Canada. |
| Fantom, William F | N. Y. C., & St. Louis R. R., Chicago, Ill. |
| Fitzsimmons, Joseph F | Erie Railroad, Hornel, N. Y. |
| Fagan, J. L | Mo. Pacific R. R., Hoisington, Kans. |
| Fedler, Lawrence R | R. C. Shop, Davenport, Ia. |
| Ford, Charles L | Daniel Shea Boiler Works, Memphis, Tenn. |
| Follin, E. F | St. L. & W. R. R., Pine Bluff, Ark. |
| Frick, Charles E | New Jersey Boiler Works, Boonton, N. J. |
| Fisher, Elisha B | Fore R. Machine & Eng. Company, Chicago, Ill. |
| Foley, D. G | N. Y., N. H. & H. R. R., Green Island, N. Y. |
| Fourness, Charles E | C. M. & St. P. R. R., Milwaukee, Wis. |
| Fagerburg, A. P | C. & A. R. R., Bloomington, Ill. |
| Fitzsimmons, E. S | Erie Railroad, Meadville, Pa. |
| Fornstrum, John E | Menominee Boiler Works, Menominee, Mich. |
| | |
| German, John | L. S. & M. S. R. R., Kankakee, Ill. |
| Goodwin, James T | American Locomotive Company, Richmond, Va. |
| Graves, F. J | Chesapeake & Ohio Railroad, Huntington, W. Va. |
| Graefe, Fred S | A. T. & S. F. R. R., Albuquergue, New Mexico, Mex. |
| Gowan, Thomas | New Orleans Boiler Works, New Orleans, La. |
| Green, Thomas | Mo. Pacific Railroad, St. Louis, Mo. |
| Gaul, G. B | D. & R. G. R. R., Pueblo, Col. |
| Gray, Frank | C. & A. R. R., Bloomington, Ill. |
| Gallagher, Peter F | Southern Railway, Selma, Ala. |

Grace, D. J..........................C. R. I. & P. R. R., Horton, Kas.
Hahn, George E........................D. L. & W. R. R., Scranton, Pa.
Harris, Floyd.............................D. & H. R. R., Oneonta, N. Y.
Harthill, John....................L. S. & M. S. R. R., Elkhart, Ind.
Hempel, C. L.....................Union Pacific Railroad, Omaha, Neb.
Hennessy, E. J.....................N. Y. C. & H. R. R. R., Depew, N. Y.
Hodgson, W. J.................................A. C. L., Waycross, Ga.
Howe, F. J..............................C. B. & Q. R. R., Creston, Ia.
Happ, W. H......................C. M. & St. P. R. R., Dubuque, Ia.
Hastings, Willard M...................N. & W. R. R., Portsmouth, O.
Hosie, Robert..................Brandon Boiler Works, Brandon, Man.
Holloway..........................................Los Angeles, Cal.
Horsley, William..................Bigelow Brothers, New Haven, Conn.
Hall, Howard..................Illinois Central Railroad, Jackson, Tenn.
Hooper, Elmer A..................H. B. Brach & Son, Hartford, Conn.
Hodges, A. R.........................Texas & Pacific, Marshall, Tex.
Hursch, P. S................N. Y., N. H. & H. R. R., New Haven, Conn.
Hewitt, J. H......................N. Y. C. & St. L. R. R., Conneaut, O.
Hodges, D. G.......................N. J. & K. C. R. R., Mobile, Ala.
Hotaling, Tunis W..............Syracuse Boiler Works, Syracuse, N. Y.
Hedberg, Andrew..........................C. & N. R. R., Boone, Ia.
Hardesty, Fred H..........Fort Worth Boiler Works, Fort Worth, Tex.
Hewitt, Robert.....................C. & N. W. R. R., Escanaba, Mich.
Herr, George B..............Southern Pacific Railroad, Sacramento, Cal.
M. T. Herron.........................................Philadelphia, Pa.

Johnson, James T..............Santa Fe System, Albuquerque, N. M.
Joyce, James..............................Intercolonial, Moncton, N. B.
Johnson, Lewis S..........................Ntl. De Mex., Laredo, Tex.
Jones, J. M...........................................Cambridge, Mass.
Jourdonias, L.................United Verde C. Company, Jerome, Ariz.
Jackson, John F..............Coastville Boiler Works, Coastville, Pa.
Jeffery, H. S..........Waterous Eng. Company, Brantfort, Ont., Canada.
Jameson, L. A.....................Southern Railway, Knoxville, Tenn.
Jackson, R. H....................N. Y. C. & H. R. R. R., Buffalo, N. Y.

Kavanaugh, E. P.........................B. & O. R. R., Baltimore, Md.
Keller, H...........................Q. & C. R. R., Chattanooga, Tenn.
Kennedy, E. F.........................D. S. S. & A., Marquette, Mich.
Kiddy, Harry...........................P. R. R., Indianapolis, Ind.
Kelly, T. J.............................P. M. R. R., Grand Rapids, Mich.
Kurrasch, Charles R.....................I. I. & I. R. R., Kankakee, Ill.
Krum, William,......Chicago & Northwestern Railroad, Eagle Grove, Ia.
Krause, Charles................................Big Four, Delaware, O.
Kline, Charles J....................N. Y. C. & H. R. R., Albany, N. Y.
Kane, J. M................Mt. State Boiler Works, Parkersburg, W. Va.
Kuhn, Thomas..........................Erie Railroad, Hornell, N. Y.
Klein, Charles A...............Oldham Taylor Company, Memphis, Tenn.
Kyler, Earl..................Watrous Eng. Co., Brantford, Ont., Canada.

Linstrom, C. W...Waterous Eng. Company, Brantford, Ont., Canada.
Laughridge, William H................Hock. Vay. R. R., Columbus, O.
Lawler, William.....................D. M. & N. R. R., Proctor, Minn.
Lewis, Thomas..................................U. P. R. R., Omaha, Neb.
Letteri, Charles......................Pennsylvania Lines, Columbus, O.
Lovick, Joseph H...................................New Castle, Pa.
Lucas, A. N.......................C. M. & St. P. R. R., Milwaukee, Wis.
Liscomb, E. T...........................C. R. I. & P. R. R., Salida, Col.
Lowe, Thomas W...............................Winnipeg, Manitoba.
Lape, C. F....................Scully Steel & Iron Company, Chicago, Ill.
Lewis, Charles W..............Exeter M. & B. Works, West Pittson, Pa.
Lothrup, Fordyce L.........................Erie Railroad, Cleveland, O.
Lidnighton, James................Cambridge Iron Works, Boston, Mass.
Lupton, Samuel J....Canadian Pacific Railroad, Calgary, Alberta, Canada.

| | |
|---|---|
| Lasker, George | Chicago, Ill. |
| Learch, Frank S. | K. O. & K. C., Milan, Mo. |
| Lester, Claude E. | Erie Railroad, Meadville, Pa. |
| Linderman, F. A. | Michigan Central Railroad, Jackson, Mich. |
| Lyon, Thomas | Baldwin Locomotive Works, Philadelphia, Pa. |
| McAllister, Joseph | D. L. & W. R. R., Buffalo, N. Y. |
| McCoy, M. W. | Big Four, Wabash, Ind. |
| McCoy, Robert B. | N. & W. R. R., Portsmouth, O. |
| McCandless, C. C. | M. K. & T. R. R., Denison, Tex. |
| McGrath, B. F. | N. Y. C. & H. R. R. R., Oswego, N. Y. |
| McKeown, John | Erie Railroad. Gallion, O. |
| McKeown, William A. | L. V. R. R., Buffalo, N. Y. |
| McNamara, P. J. | L. E. & W. R. R., Lima, O. |
| McNevin, J. D. | Big Four, Indianapolis, Ind. |
| McElvy, G. B. | S. A. L. R. R., Savannah, Ga. |
| McCurdy, R. P. | Milwaukee, Wis. |
| McAllister, M. M. | L. S. & M. R. R., Glenville, Ohio. |
| McAleman, George R., | James Lappan & Son Boiler Works, Pittsburg, Pa. |
| McNamara, R. A. | Casualty Company of America, Kansas City, Mo. |
| McKerihan, T. J. | Pennsylvania Railroad, Juniata, Pa. |
| McNickle, Robert F. | C. & N. W. R. R., Winona, Wis. |
| Mernier, Wilfred | Anaconda C. M. Company, Anaconda, Mont. |
| Mullen, E. J. | C. B. & Q. R. R., Aurora, Ill. |
| Morgan, J. J. | N. & W. R. R., Portsmouth, O. |
| Moses, L. O. | K. & M. R. R., Middleport, O. |
| Martin, J. T. | American Locomotive Company, Richmond, Va. |
| Mallan, T. L. | P. R. R., Trenton, Pa. |
| Murphy, A. A. | St. L. & S. F. R. R., Cape Girardau, Mo. |
| Mitchell, James T. | Colorado Southern Railroad, Trinidad, Col. |
| Murray, Charles J. | Erie Railroad, Meadville, Pa. |
| Malley, J. P. | 'Frisco System, Springfield, Mo. |
| Mayer, F. A. | Laredo, Tex. |
| May, H. P. | Springfield Boiler Works, Springfield, Ill. |
| Madden, T. P. | Mo. Pacific Railroad, Sedalia, Mo. |
| Meyers, Barney | Springfield Boiler Works, Springfield, Ill. |
| Major, Richard L. | York Manufacturing Company, Dover, York County, Pa. |
| Miller, Irwin R. | Cleveland Eng. & B. Company, Davenport, Ia. |
| Miller, Theo. J. | Mertes & Miller Boiler Company, Milwaukee, Wis. |
| Mowat, John S. | Vulcan I. Works, Winnipeg, Man. |
| Marinan, James J. | Davenport Locomotive Works, Davenport, Ia. |
| Munro, Charles | Manitoba Iron Works, Winnipeg, Man. |
| Meyers, J. L. | Panhandle Route, Dennison, O. |
| Mace, N. C. | Paso C. F. & M. Company, El Paso, Tex. |
| Noud, Edw. | N. Y. O. & W. R. R., Middletown, N. Y. |
| Nichols, Joseph | M. P. R. R., Fort Scott, Kan. |
| Neisler, T. S. | American Locomotive Company, Richmond, Va. |
| Nokoila, Phil G. | C. & A. R. R., Bloomington, Ill. |
| Nees, William | Baldwin Locomotive Works, Norwood, Delaware County, Pa. |
| O'Conner, J. J. | |
| O'Neil, Thomas | L. V. R. R., Sayre, Pa. |
| Ord, William R. | Grand Trunk Railroad, Stratford, Ont., Canada. |
| Optenberg, J. H. | Optenberg & Soneman, Cheboygan, Wis. |
| Oliver, Thomas R. | B. & M. R. R., Tawas, Mich. |
| Peterman, H. W. | A. C. L. R. R., Sanford, Fla. |
| Pogue, R. | Pennsylvania Lines, Allegheny. Pa. |
| Powell, J. A. | Central of Georgia, Columbus, Ga. |
| Plowman, W. | Big Four, Urbana, Ill. |
| Pomfret, John | American Locomotive Company, Paterson, N. J. |
| Parvin, Glenn S. | American Locomotive Works, Paterson, N. J. |
| Phillips, C. R. | Shelby, S. T., Company, Cleveland, O. |

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| Pearson, R. A. | Canadian Pacific Railroad, Calgary, Alberta, Canada. |
| Petticrew, L. A. | D. & R., G. R. R., Salt Lake City, Utah. |
| Patrick, Charles P. | New Jersey Boiler Works, Boonton, N. J. |
| Rahrle, Frank | B. & O. S. W. R. R., Chillicothe, O. |
| Rogers, Daniel A. | Santa Fe System, San Bernardino, Cal. |
| Ryan, J. J. | B. & O. R. R., Cleveland, O. |
| Ryan, C. | U. P. R. R., Omaha, Neb. |
| Reynolds, Charles J | B. & O. R. R., Du Boise, Pa. |
| Ryan, G. S. | B. R. & P. R. R., Du Boise, Pa. |
| Riley, George N. | National Tube Company, Pittsburg, Pa. |
| Rapps, H. J. | Illinois Central Railway, Waterloo, Ia. |
| Ritchie, W. J., S. C. R. R. | |
| Rauk, Olavis K. | J. I. Case Manufacturing Company, Racine, Wis. |
| Rheutan, Garrett H. | Dillon Boiler Works, Fitchburg, Mass. |
| Rogers, E. W. | American Locomotive Works, Paterson, N. J. |
| Sarver, B. F. | Pennsylvania Railroad, Ft. Wayne, Ind. |
| Schultz, William A. | Pennsylvania Railroad, Wellsville, O. |
| Shaw, W. H. | B. R. & P. R. R., Du Bois, Pa. |
| Shaffer, S. J. | N. Y. C. & H. R. R. R., Vilas Pa. |
| Shupert, Frank W. | Santa Fe System, San Bernardino, Cal. |
| Smith, John B. | Pittsburg & Lake Erie R. R., McKees Rocks, Pa. |
| Shoemaker, C. F. | P. M. R. R., St. Thomas, Ontario. |
| Smallwood, Thomas G. | T., St. L. & W. R. R., Frankfort, Ind. |
| Stewart, Charles | A. T. & S. F. R. R., Winslow, Ala. |
| Seigfried, W. | L. V. R. R., Sayre, Pa. |
| Stephens, J. | Canton, O. |
| Seyboldt, Joseph G. | Titusville Iron Company, Titusville, Pa. |
| Sullivan, F. J. | Illinois Central Railroad, Freeport, Pa. |
| Shoemaker, William | Chicago, Ill. |
| Smythe, J. H. | American Locomotive Company, Paterson, N. J. |
| Stillwell, E. E. | F. C. M. R. R., Arizona, Vera Cruz, Mexico. |
| Schillinger, J. G. | C. R. I. & G. R. R., Falhart, Tex. |
| Super, Daniel P. | International Boiler Works, E. Stroudsburg, Pa. |
| Smith, C. H. | Mexican Central Railroad, Aquascalienties, Mexico. |
| Syrie, William | Waterous Eng. Company, Brantford, Ont., Canada. |
| Schaffer, C. E. | D. Connelly Boiler Company, Cleveland, O. |
| Smyth, Burrows M. | Moose Jaw, Prov. Saskatcheman, Canada. |
| Shea, Ed. | Daniel Shea Boiler Works, Memphis, Tenn. |
| Stokes, John E. | Illinois Central Railroad, Clinton, Ill. |
| Smith, John J. | Canadian Pacific Railroad, Riverstak, B. C. |
| Stewart, L. M. | Atlantic Coast Line, Sanford, Pa. |
| Smalley, John N. | Lacey Pipe Shop, Los Angeles, Cal. |
| Scull, Jefferson | Dickson Locomotive Works, Scranton, Pa. |
| Snyder, Charles | American Locomotive Works, Scranton, Pa. |
| Smith, Hugh | Erie Railroad, Jersey City, N. J. |
| Spencer, James T. A. | C. M. & St. P. R. R., Milwaukee, Wis. |
| Sago, John | Cole Manufacturing Company, Newman, Ga. |
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| Thomas, William F. | P. & R. U., Peoria, Ill. |
| Taylor, Charles F., Jr. | Long Island Railroad, Morris Park, N. Y. |
| Talbott, T. J. | American Locomotive Company, Manchester, Va. |
| Tierney, J. E. | C. B. & Q. R. R., Chicago, Ill. |
| Timms, W. A. | American Locomotive Company, Richmond, Va. |
| Troy, John | Ann Arbor Railway, Owosso, Mich. |
| Tynan, J. B. | W. & L. E. R. R., Norwalk, O. |
| Thomas, William F. | P. & R. U., Peoria, Ill. |
| Throckmorton, Beverly | Allis-Chalmers Company, Scranton, Pa. |
| Twitt, David | Standard Oil Company, Whiting, Ind. |
| Taylor, A. I. | Southern Railway, Selma, Ala. |
| Toesch, F. P. | Hicks Locomotive Works, Spencer, Ga. |
| Tucker, W. M. | I. C. R. R., Paducah, Ky. |

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| Ulm, George. | |
| Wagstaff, George | N. Y. C. & H. R. R. R., Buffalo, N. Y. |
| Waite, C. E. | F. E. C., St. Augustine, Fla. |
| Wigmore, S. J. | N. & W. R. R., Roanoke, Va. |
| Wilde, C. F. | Mobile & Ohio R. R., Jackson, Tenn. |
| Wulfeck, Martin | C. & O. R. R., Covington, Ky. |
| Wondberg, H. J. | C., M. & St. P. R. R., Minneapolis, Minn. |
| Woody, W. H., Jr. | Chicago Pneumatic Tool Company, Richmond, Va. |
| Wood, Thomas | McIlvain & Spiegel, Cincinnati, O. |
| Weir, James C. | Copper Range, Houghton, Mich. |
| Ward, James T. | Chicago, Ill. |
| Wratten, Henry L. | Freedman & Sons, Racine, Wis. |
| Wilson, William M. | Illinois Central, Railroad, Chicago, Ill. |
| Wolfe, Charles F. | Waterous Eng. Company, Brantford, Ont., Canada. |
| Wilde, Joseph J. | Robb & Mumford Boiler Works, South Farmington, Mass. |
| Werner, Thomas | Coastville Boiler Works, Coastville, Pa. |
| Wehling, C. W. | Fidelity & Casualty Company, Rome, N. Y. |
| Wilson, Clarence L. | I. C. R. R., Louisville, Ky. |
| Walters, Harry | American Locomotive Works, Scranton, Pa. |
| Wyder, John O. | El Paso Foundry & Machine Company, El Paso, Tex. |
| Wyder, Otto J. | Copper Queen Reduction Company, Douglas, Ariz. |
| Wiese, John E. | Atlas Eng. Works, Georgetown, Ky. |
| Wood, George F. | Quincy Pt. S. B. & M. Company, Paterson, N. J. |
| Young, Reynold C. | C. & N. W. R. R., Baraboo, Wis. |
| Young, R. W. | C. M. & St. P. R. R., Dubuque, Ia. |
| Zepp, Fred A. | Erie Railroad, Susquehanna, Pa. |
| Zimmerman, William M. | Houston, Stanwood & Gamble, Covington, Ky. |

## ASSOCIATE MEMBERS.

| | |
|---|---|
| Cook, E. C. | Grand Central Passenger Station, Chicago, Ill. |
| Duntley, W. O. | Chicago Pneumatic Tool Company, Chicago, Ill. |
| Duntley, J. W. | Chicago Pneumatic Tool Company, Chicago, Ill. |
| Gilmour, George | Travelers Insurance Company, Hartford, Conn. |
| Gregg, C. R. | Scully Steel & Iron Company, Chicago, Ill. |
| Phillips, C. R. | Shelby S. T. Company, Cleveland, O. |
| Wood, William H. | Media, Pa. |

# THE LADIES' AUXILIARY.

Cleveland, Ohio., *May* 23, 1907.

The Ladies' Auxiliary of the International Master Boiler Makers' Association met in the Palm Room of the Hollenden Hotel, with the President, Mrs. J. McKeown, in the chair.

The minutes of the last meeting were read and approved.

The roll was called, with the Second Vice-President, Mrs. C. L. Hempel, absent.

The Secretary reported expenses for the year $1.36, leaving a balance of 14 cents in the treasury.

The following officers were elected for the ensuing year:

*President*........................Mrs. John McKeown
*First Vice-President*................Mrs. J. H. Smythe
*Second Vice-President*.................Mrs. T. C. Best
*Third Vice-President*................Mrs. C. L. Hempel
*Fourth Vice-President*..........Mrs. E. P. Kavanaugh
*Secretary*...........................Mrs. J. E. Cooke

For the good of the order Mrs. Smythe suggested that the ladies correspond during the year, if possible, especially in case of sickness or trouble. It was also decided to exchange cards.

Mrs. Laughridge, Mrs. Lucas and Mrs. Smythe were appointed as a committee to thank the supply men for their kindness and entertainment during the convention.

An adjournment was had, to meet in Detroit in May, 1908.

Mrs. J. E. Cooke,
Secretary.

# MEMBERS OF THE LADIES' AUXILIARY.

| | |
|---|---|
| Mrs. L. Norneman | Indianapolis, Ind. |
| Mrs. A. Cooper | St. Joseph, Mo. |
| Mrs. E. C. Cook | St. Louis, Mo. |
| Mrs. T. B. Cram | Chicago, Ill. |
| Mrs. R. H. Davis | Ogden, Utah |
| Mrs. H. Denzier | Indianapolis, Ind. |
| Mrs. J. A. Doarnberger | Roanoke, Va. |
| Mrs. Henry Ehret | Cape Gorardeau, Ind. |
| Mrs. J. H. Filcer | Indianapolis, Ind. |
| Mrs. M. J. Foley | Grafton, W. Va. |
| Miss Marie Foley | Grafton, W. Va. |
| Mrs. J. T. Goodwin | Richmond, Va. |
| Mrs. Andrew Green | Indianapolis, Ind. |
| Mrs. George E. Hahn | Scranton, Pa. |
| Mrs. C. L. Hempel | Omaha, Neb. |
| Mrs. John Holland | Sedalia, Mo. |
| Mrs. E. J. Hennessy | Depew, N. Y. |
| Mrs. W. H. Laughridge | Columbus, O. |
| Miss May Lawlor | Proctor, Minn. |
| Mrs. A. N. Lucas | Milwaukee, Wis. |
| Mrs. E. F. Kennedy | Marquette, Mich. |
| Mrs. E. P. Kavanaugh | Baltimore, Md. |
| Mrs. William McKeown | Buffalo, N. Y. |
| Mrs. John McKeown | Galion, O. |
| Mrs. J. H. O'Brien | Dennison, O. |
| Mrs. W. Plowman | Urbana, Ill. |
| Miss M. Plowman | Urbana, Ill. |
| Mrs. C. R. Phillips | Cleveland, O. |
| Mrs. W. J. Ritchie | Memphis, Tenn. |
| Mrs. S. J. Shaffer | Vilas, Pa. |
| Mrs. W. H. Shaw | DuBois, Pa. |
| Miss Harriet Unkenholz | Ottowa, O. |
| Mrs. C. F. Wilde | Jackson, Tenn. |
| Mrs. J. W. Williams | St. Louis, Mo. |

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| Mrs. Mary Wilde | Jackson, Tenn. |

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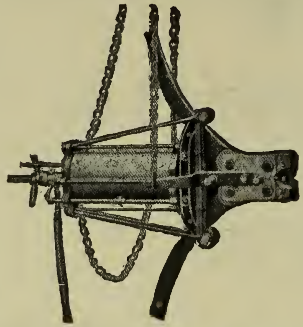

that **cuts off** the **bolts straight** and **smooth ready for riveting** and bolts of any length. Cuts at the rate of **780** an **hour. Easy** to **handle** and **operate.** Powerful, durable and economical in consumption of air. Has small inserted knives, replaced at little cost. **Conceded** to be the **only satisfactory Staybolt Clipper** on the market.

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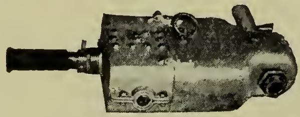

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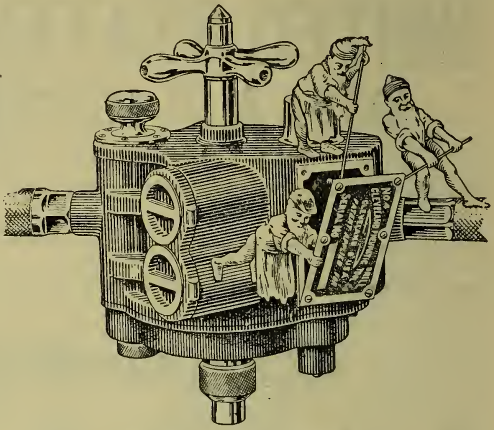

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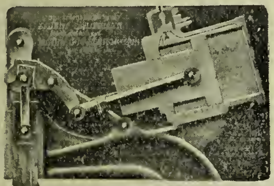

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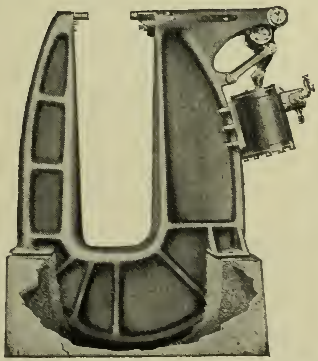

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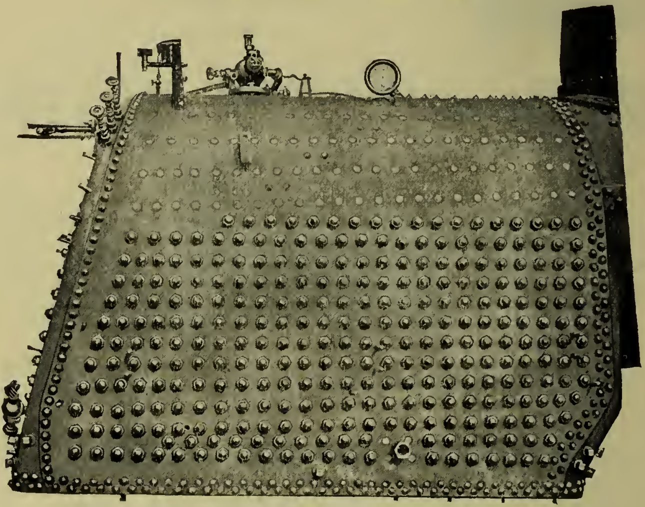

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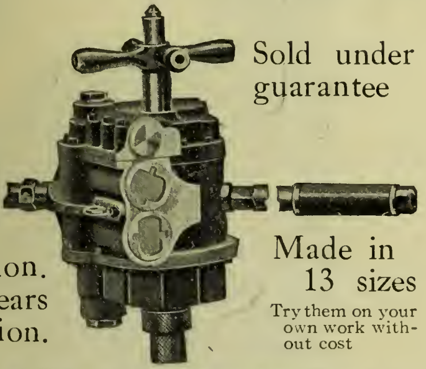

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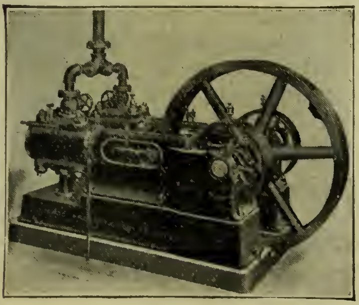

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PNEUMATIC TOOL
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**CHICAGO NEW YORK**

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## Hydraulic Machinery

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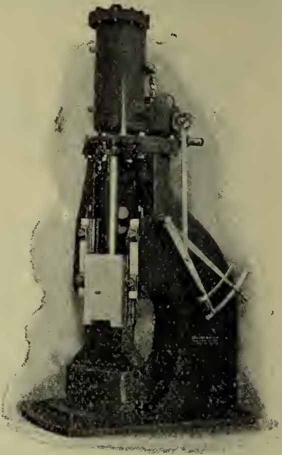

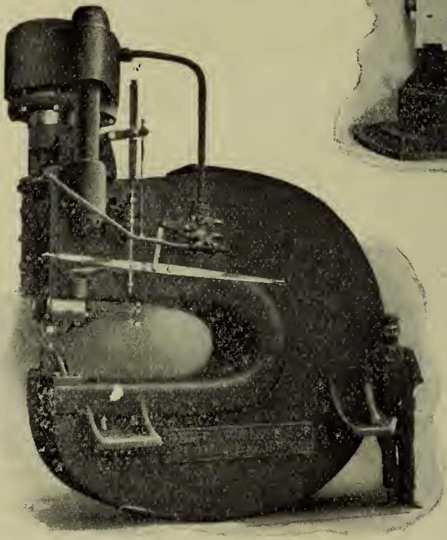

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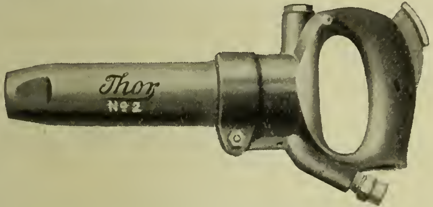

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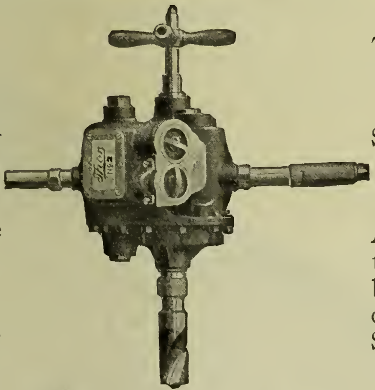

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